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No. 2959

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AUGUST 10, 1934

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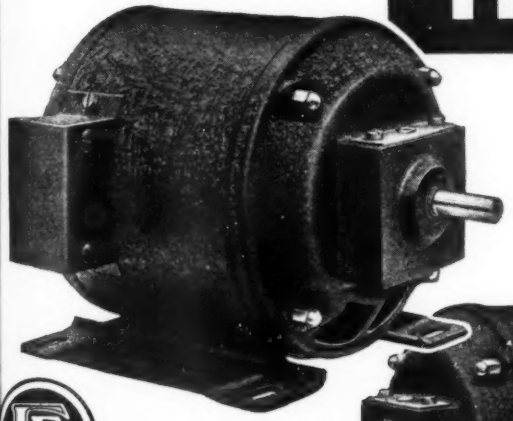

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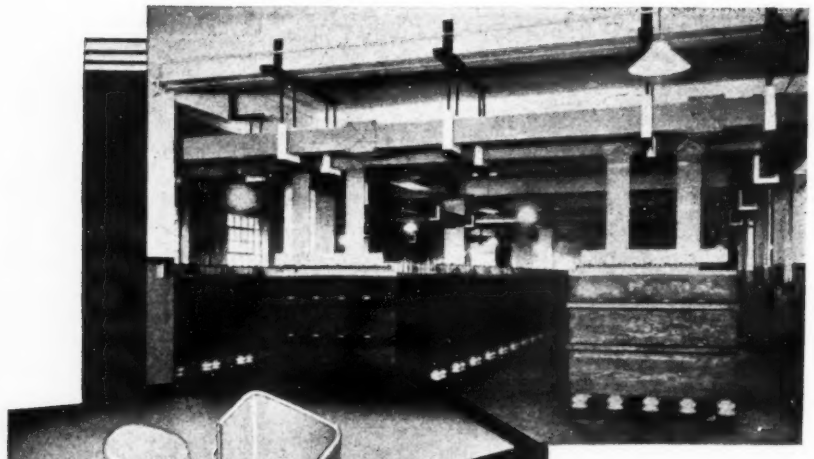
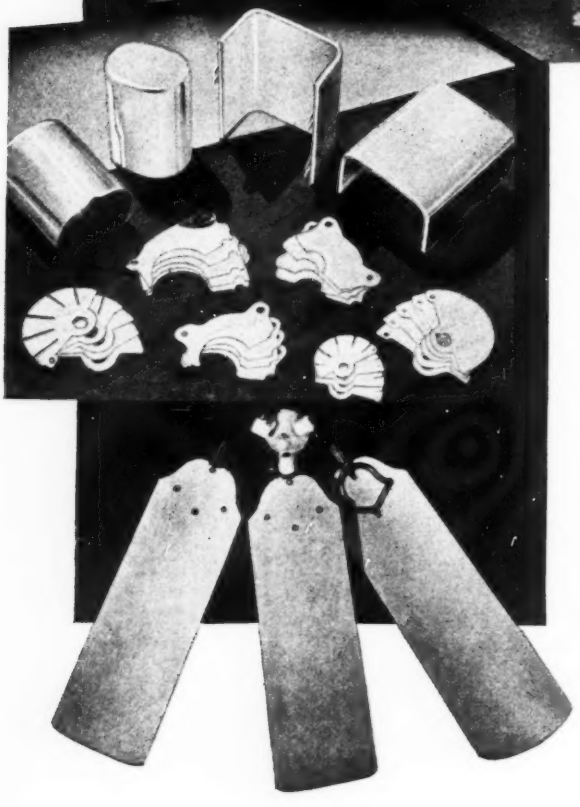


BUSBARS and CONNECTIONS

Considered from the standpoint of current-carrying capacity aluminium busbars show a distinct cost saving. Furthermore, aluminium is so light and so easy to bend and drill that there is a further definite saving in labour charges and cost of supports. The illustration shows a large installation of aluminium busbars in the battery room at the Mayfair Automatic Telephone Exchange of the Post Office.



RADIO METALWORK

In the radio industry many forms of metalwork are now standardised in aluminium and its alloys. By far the greater portion of this work is in pure aluminium and the photograph here is an example of its application to condenser vanes and screens. (Manufacturers, Messrs: Plessey Co., Ltd., Ilford.)

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The Growing Demand

HOW far has the increased output of our generating stations during the past twelve months been due to a real recovery in industry? We know from official sources that the rate of growth in 1933 of 9.6 per cent. for the whole of Great Britain was made up of such widely differing regional advances as 2.73 per cent. in North-East England and 27.8 per cent. in East England.

The results achieved by some of our larger municipalities, the annual reports of which are now coming in, throw some light on the situation. Thus, Birmingham, for the twelve months ended last March, added sixty million kWh to its sales, bringing the total up to nearly 500 million. That this is due very largely to general trade improvement is borne out in the report of the S.W. Midlands Joint Advisory Committee (representing the S.W. and S. Power Co. as well as municipal undertakings), which gives an increase of 12 per cent. for this wide area, the bulk of it for motive power.

Later figures from Birmingham relating to the past quarter indicate that the position is being more than maintained; an increase of one-fifth in the total output compared with the same period last year is due mainly to a growth of the power consumption by 25 per cent. Also nearly 30,000 h.p. of motors was connected in the same period.

The increase in power units in West Ham, while less than in the previous municipal year, was still nearly 10 per cent., representing three times that of the domestic units, although the latter gave the more spectacular figure of 28 per cent. A small reduction of sales to engineering works in Manchester was offset by a slight upward movement among other power applications, but the 6.6 per cent. increase for the undertaking as a whole was mainly due to bulk supplies and sales to domestic consumers. Lancashire's textile trade problems are a dominant factor in the situation.

Liverpool, similarly to Manchester, owed little of its 6.8 per cent. to industry, but Leeds bettered its power sales by 15 per cent., although the h.p. of motors installed remained almost stationary.

With its revised two-part tariff, Bristol appears to be enjoying a boom in the domestic field, an advance of 20 per cent. owing little to the power load. The most notable feature of the returns from Stoke-on-Trent is that the twelve enamel kilns, which between them take one-ninth of the undertaking's output, have increased their consumption by one-quarter. The overall rate for this load appears to be about 0.39d. per kWh.

Allowing for the different sizes of the undertakings (*e.g.*, Manchester's increase of only 2¼ per cent. for motive power in relation to total sales means over ten million kWh) and for the output for industrial purposes being usually many times that for domestic use, the returns we have examined indicate that, while in some areas the load power is rapidly picking up and in most cases the number of new motors connected is more than proportionate, there is still far more activity in domestic development—an activity which the returns show to be accelerating.

The Factories Report

THE report of the Chief Inspector of Factories reviewed in this issue makes encouraging reading from the electrical point of view. It is shown that trade expansion has brought in its train increased use of electricity. Particular mention is made of the driving of large steel rolling mills, the installation of large steel melting and refining furnaces, and the extended use of electricity in textile factories, as well as developments in electric arc welding in shipbuilding and constructional engineering work. The report shows that in spite of the tremendous increase in the use of electricity in industry during the past ten years, the annual number of electrical accidents on factory premises has remained almost stationary. But accidents still happen, mainly due, it would appear, to risks taken by skilled persons and not to defects in the design of apparatus. It is evident that

greater attention is being paid to the observance of regulations; last year there were only seven prosecutions as compared with sixteen in 1932.

Poor Industrial Lighting

AN incredible state of affairs in the matter of factory lighting was revealed by an investigation recently made by the Factory Inspectorate in the city of Sheffield. According to the Chief Inspector only twenty-seven out of 475 factories visited possessed really up-to-date lighting installations. In some places batswing gas-burners and even candles were discovered. When electric lighting was employed it was found that often no regard had been paid to the special conditions; lighting contractors had been content merely to apply their ideas of house lighting to places requiring far different treatment. If Sheffield is typical—and so far as we know other industrial centres have nothing to pride themselves upon in this respect—an immense scope for the electric lighting engineer is indicated. As Mr. Wilson says, "Improvement is largely a matter of education, and factory occupiers have not been slow to respond when the facts have been brought forcibly before them." There seems to be an excellent opportunity for another Industrial Lighting Campaign.

Brighter Spots

IT is only fair to present the other side of the picture. All is not unrelieved gloom, for many industrialists are enlightened in the full sense of the word. In several works to which visits were paid by inspectors the latest developments in the lighting art were found in use. Floodlighting, gaseous discharge lamps, and "daylight" illumination are being employed to an increasing extent, and in some cases scientific lighting control has been adopted. Full publicity should be given to these good examples, for in industry, as in other spheres, emulation plays a large part in improvement.

Peak-load Stations

THE tendency to build new base-load stations outside the area of supply to deal with peaks by less efficient existing stations that are usually situated near the centre of gravity of the load works out well at the present time, as the standing charges on the latter must be met in any case, and their higher running charges are of little consequence at low load factors. It is conceivable that in some congested areas peaks beyond the capacity of the local stations cannot be dealt with conveniently from the grid. The sites are presumably not suited for base-load stations, and new designs of plant will be called for in which low capital cost and small space requirements, especially, will predominate over operation efficiency. Quick-starting properties are in favour of the heavy-oil engine for peak-load and emergency work, but can we hope for units of individual outputs, weight per h.p. and price per kW suitable for these conditions? Remarkable progress along these lines has been made in recent years, but there is a very long way to go yet.

Welcome News

FOLLOWING upon the reductions in charges earlier this year in the Essex and Surrey parts of its area, the County of London Electric Supply Co. announces that as from the fourth quarter of the current year prices will be substantially reduced throughout a wide area south of the Thames. Both business and domestic consumers are to benefit; in each case the "unit" rate under the two-part tariff is reduced from ½d. to ¼d. This is a great step towards the low uniform rate which is so desirable if electricity is to make proper headway. For the present we would be glad to see a halfpenny per unit prevailing throughout the London and Home Counties area until such time as an even lower charge can be made. With a charge as low as this the manifold applications of electricity in the home are brought within the reach of a great majority of the people. We hope that the rest of the London companies and municipalities who have not yet decided to institute a halfpenny rate will follow the good example of the County Co. and its associates. We also hope that those undertakings (such as the Joint Electricity Authority) who have a halfpenny rate for the summer and a higher one for the winter will consider the wisdom of uniformity.

What is Responsibility?

MANY younger electrical engineers took advantage of the recent discussion in our Correspondence columns to express their views regarding the tests for membership of the Institution of Electrical Engineers. We are most in sympathy with those who, having passed the graduateship examination, find themselves, after several years of practical experience, ineligible for associate membership because their positions in the industry are not recognised as carrying enough responsibility. The definition of responsibility in each case is a most difficult task for a selection committee, which may be naturally liable to set too much store on a high-sounding title bestowed upon an aspirant for corporate membership by his chief. There are many "assistants" who are better qualified technically, are more highly paid, and shoulder more real responsibility than heads of departments in smaller concerns. We hope that the Membership Committee will give this aspect its sympathetic consideration.

Imported Accessories

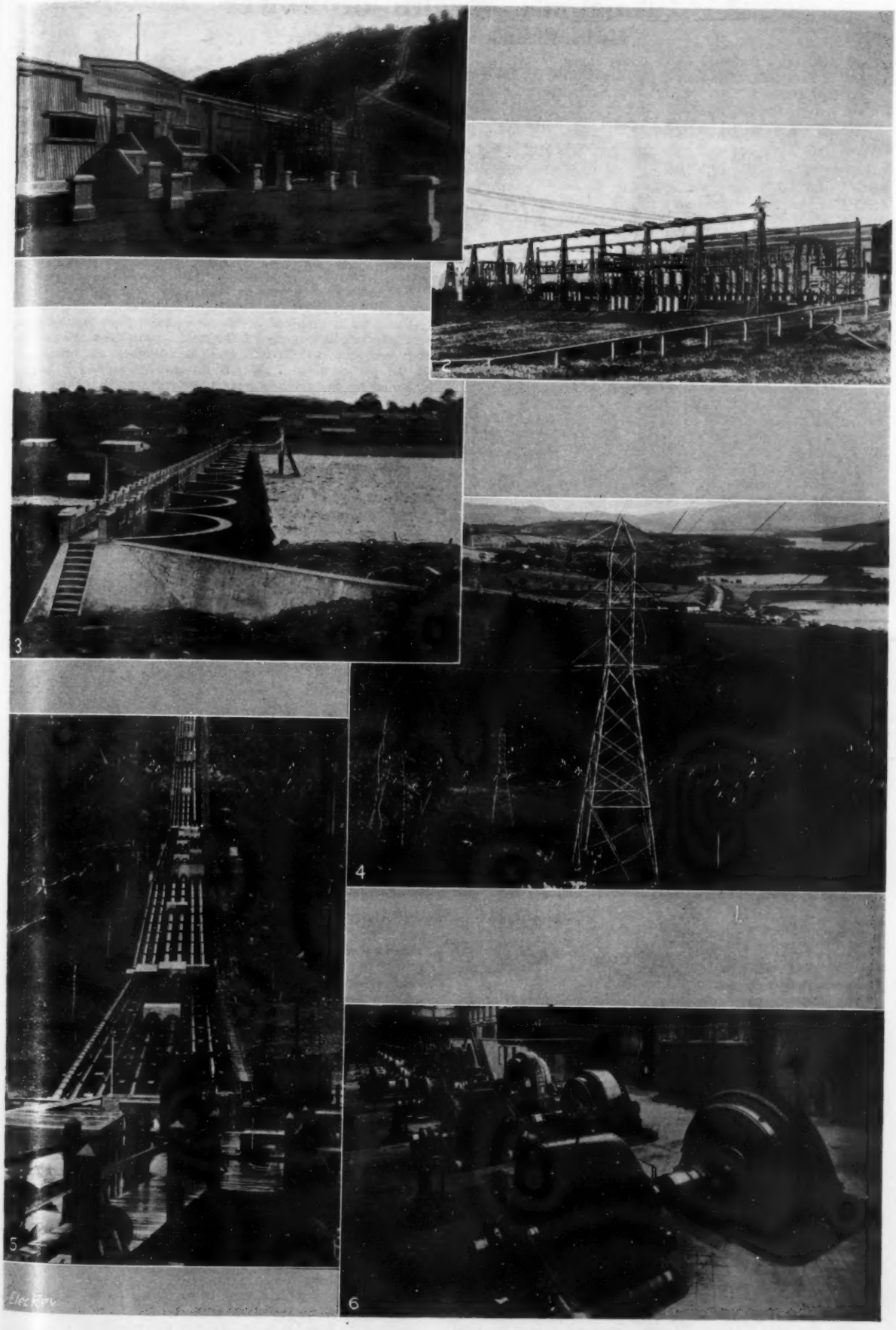
THE British Electrical and Allied Manufacturers' Association has issued a reminder that to-day (August 10th) an exemption order granted by the Board of Trade in respect of the marking of certain imported electrical accessories ceases to have effect. Accordingly these goods must now bear an indication of their foreign origin. As B.E.A.M.A. says, the public wants to buy British electrical accessories, which have a deservedly high reputation, and, on quality, are as cheap as the foreign product, but hitherto purchasers have found it difficult to distinguish the sheep from the goats, owing to the clever imitations which have been imported. Now they will be able to buy with certainty, and, it is hoped, will "buy British."

The Shut-down

IT is not surprising that impatience is being expressed in certain quarters regarding the lack of official explanation of the cause of the shut-down of the grid system that occurred last Sunday week in South-East and Eastern England. A letter from "Anxious Consumer" published in *The Times* on Tuesday makes allowance for "teething troubles," but not for the failure of the C.E.B., the Electricity Commissioners and the Electrical Development Association to offer the public any explanation of the interruption. When we went to press with our last issue it was stated that the officials were still carrying out their investigations, and we understand that the matter is still being inquired into. The failure was, as already stated, apparently due to a combination of circumstances which is unlikely to repeat itself, but it is obvious that from the public standpoint every practicable precautionary measure must be taken to prevent recurrence. The public is, however, probably less concerned to know the actual technical and operational details of the cause, or to hear discussions regarding responsibility, than it is to have vouchsafed to it such an official explanation as will give it confidence for the future.

Other Stoppages

SEVERAL other breakdowns have been reported this week—not grid failures. They were ordinary distribution mishaps at Islington and Putney, but the grid actually rendered assistance in the case of the third—the emergency which arose at Scarborough. Whatever the outcome may be, the disquieting point about supply disturbances is not the simplicity of the cause so much as the fact that a local functional manœuvre may develop into a complication with widespread detrimental consequences.



Hydro-Electric Development in Tasmania. **(See page 174)**

1. The Waddamana power station. 2. The Hobart sub-station—50,000-h.p. capacity. 3. The Great Lake Dam at Miena, Central Tasmania. 4. An 88-kV steel tower double-circuit transmission line. 5. The pipe lines at Waddamana from the valve platform. 6. The interior of the Waddamana station showing the nine turbine sets

Tasmania's Wealth of Power

Hydro-Electric Commission report

OF Australia's potential water power, some 74 per cent. is in Tasmania. Although in this island there is 1,739,000 e.h.p. available, only 77,000 e.h.p. has been developed, but this, nevertheless, represents 66.2 h.p. per square mile (26,216 sq.m. area) or 7,855 h.p. per 1,000 of population (221,000).

So far the only major development is the Great Lake 66,000-h.p. system, which is owned by the Tasmanian Government. The per capita production has, however, grown to 1,740 kWh, an achievement very largely due to the activities of the Electrolytic Zinc Co., which was attracted to the island by the prospect of cheap power.

By the use of water power electricity is being produced at less than half what it costs the major fuel power stations on the Australian mainland. Indeed, the island is so richly endowed that its hydro-electric resources could hardly ever be fully utilised by the ordinary commercial and domestic requirements of its population, no matter how they might grow, without the establishment of special high-load-factor industries.

The Commission's Work

Since the inception of the undertaking in 1916 the capital expenditure has amounted to £3,792,493. The Hydro-Electric Commission was established in 1930 and its report for 1932-33 shows that the year's revenue was £388,577, an increase of £10,972, which provided a net profit of £7,585.

The period under review was one of depression, but the revenue from bulk supplies improved by £600 to £160,980 and there was a slight rise in the load curve. The system peak reached 46,500 kW, an increase of 900 kW, while the energy generated was 5.75 million kWh more than in the previous year, aggregating 338,484,500 kWh.

The principal power station at Waddamana, almost at the centre of the island, had a non-stop year with a load factor of 82.5 per cent. It carried a peak load of 45,300 kW and generated 335,853,600 kWh. The Devonport stand-by steam station was not required during the year; some of the boilers have been converted from wood to oil fuel.

Bulk supply records show that the Hobart district with 14,225 kVA of connected load made a maximum demand of 7,910 kW and purchased 26,499,430 kWh; the country districts, 12,400 kVA, 3,241 kW and 13,126,603 kWh; the Launceston City Council, 11,826 kVA, 3,785 kW and 12,775,430 kWh; the Electrolytic Zinc Co., 33,837 kVA, 27,700 kW and 226,409,333 kWh; the Australian Commonwealth Carbide Co., 4,500 kVA, 2,729 kW and 26,116,200 kWh; and the Goliath Cement Co., 2,327 kVA, 1,850 kW and 3,484,000 kWh.

Hobart Activities

Retail business in the Hobart metropolitan district produced a revenue of £137,563, an increase of £3,811 as compared with decreases during the two previous years. The number of "all-electric" homes was 616, an increase of sixty during the year. About 300 new consumers raised the total to 13,714, while temporarily disconnected installations numbered 610. The energy sold increased by 1 per cent. to 18,951,175 kWh, excluding the tramways. The kVA connected increased by 7 per cent. to 42,693 and a.c. motors totalled 8,156 h.p.

Of the 157 ranges (cookers) sold during the year (143 by the Commission and fourteen by firms) all but twenty were connected in the metropolitan area and suburbs, making a total of 1,173. New hot water services connected numbered seventy-four, making a total of 1,276, while thirty-nine remained disconnected.

The total number of electrical contractors and wiremen licensed during the year was 459. One examination of candidates for wiremen's licences was conducted during the year, in which nine passed and three failed. Two persons were prosecuted and convicted for carrying out electrical work without holding the appropriate licences. There is no doubt, the report states, that the licensing regulations have secured a higher grade, and a safer class, of electrical work throughout the State.

Country District Expansion

Considerable progress in the development of the country area services is reported. The retail revenue increased by 13.2 per cent. to £56,027, and the number of consumers by 9.4 per cent. to 7,255. Uniformity of service is being extended by the Commission's policy of acquiring municipal schemes.

The Commission is providing retail supplies in twenty-one municipalities and selling in bulk to eight municipalities. The proportion of country area consumers taking domestic power supplies grew from 46 to 58 per cent., and the amount of energy used for this purpose increased by 17.5 per cent. during the year. Small motors are being used more extensively for farm and orchard work, and in the Huon district the number of motive power consumers increased by 42 per cent. The average size of machine installed by the 106 consumers in 1932 was 4.7 h.p.

A view of Hobart, the capital city of Tasmania

Ten years' expansion of retail service in the country districts is indicated by the following figures: The total number of consumers increased from 279 to 7,255, lighting consumers from 279 to 7,015, domestic power consumers from 88 to 3,955, motive power consumers from 18 to 446, hot-water consumers from one to 211, bulk supply purchasers from one to nine, motors from 311 to 3,424 h.p., load connected from 512 to 12,242 kW, transformers from 365 to 7,382.5 kVA, high-voltage lines from 36.5 to 654 miles, low-voltage lines from 10.1 to 220.5 miles, energy sold from 211,400 to 11,105,336 kWh, capital expenditure from £24,470 to £315,872, and total revenue from £2,945 to £88,633, while the average price per kWh sold fell by 43 per cent., from 3.34d. to 1.91d.

Proposed General Extensions

The Commission's transmission lines, of which there are 1,055.8 circuit miles, operate at 88, 44, 22, 11, and 6.6 kV. The 88-kV transformer capacity grew by 25,500 kVA to 118,000 kVA during the year.

Investigations with a view to supplying power to proposed paper pulp works at various sites and also more power to the Electrolytic Zinc Co. have involved the possibility of erecting additional transmission lines, changing the conductor size on existing towers, increasing the transmission voltage to 110 kV, or the building of a new power station, which may add 50,000 h.p. to the system and necessitate increasing the rupturing capacity of existing switchgear.

Modern Methods of Wiring Ships. By A. Fowler

A comparison of the chief systems

IN the wiring of ships the nature of the electric cables and the method of installation are important factors. Machinery spaces, on account of both heat and moisture, demand that special consideration shall be given to the insulation of the cables and to the choice of runs, which must be clear of high temperatures as much as possible. For many years it has been customary to adopt vulcanised rubber-covered cables, sheathed in lead and protected externally by galvanised wire, with a final covering of cotton braiding. This cable is referred to as l.c.a.b. and the insulation as v.i.r.

More recently, in an endeavour to improve on rubber as an insulator, varnished cambric has been introduced. Paper-insulated cables have been used also, but not so generally in the Merchant Service as in the Navy. The difficulty occasioned in providing suitable ends to ensure the retention of the oil in the paper insulation imposes such a cost on the installation and demands so much space at all terminals, necessitating special design of boxes, &c., that its general use is out of the question.

Bare Conductors

As an alternative to any of these insulators the use of bare conductors, in the shape of flat bar or rod, does away with practically all trouble in so far as heat and moist atmosphere are concerned. This explains the increasing popularity of the bare-conductor method for connecting main generators to switchboards.

It happens not infrequently that the main conductors have to pass over or very close to steam pipes or parts of engines carrying steam. If they are rubber-insulated, then the life of the cable is limited, for not only will the insulation value fall steadily, but should it become necessary, as so often happens, to move the cables in order to change an armature or field coil, then the insulation will be seriously impaired.

Should bus-bars mounted on suitable insulators and totally encased to obviate the possibility of accidental contact be fitted in lieu of cables, then their useful life is unlimited. An occasional examination of clamping screws and bolted joints is all that is necessary, and renewals throughout the lifetime of the ship should be nil. It is usual where bus-bars are so fitted to make the risers direct from the machine easily portable in order that repairs to the machine may be carried out with the least possible dislocation.

For similar reasons it is quite good practice to provide all circuits connected to switchboards with bar or rod extensions from the main bus-bars to the top or bottom of the board, as the case may be, so that branch cables do not require to be led down the back of the board. This practice again ensures the minimum amount of disturbance to cables when effecting repairs or replacements to gear on the switchboard.

Another important feature to be considered is the choice of suitable runs for the cables in hot compartments. In modern ship-building time is a great factor, and it must be admitted that if all trades concerned with the building are to carry on their work concurrently, and finish together it is not possible at all times to obtain the best results. Frequently it happens that as the work progresses alterations are found necessary and the argument that cables can be moved with the minimum of labour and cost almost invariably results in the electrician having to give way.

Probably most breakdowns in cables occur at the terminal ends and not in the unbroken length. Unfortunately, the recognised method of attaching terminals to cables is by soldering, and this cannot be accomplished without causing injury to the insulation. The resultant condition is that the part of the cable which is already denuded of its natural protection in the shape of lead sheathing, armouring, &c., is further weakened by the application of heat during soldering and becomes the weakest part, in a position where it may be subjected to wide variations in temperature and considerable access of moisture or oil. Were it possible to obtain the necessary contact surface efficiently by some clamping method, thus averting the necessity for soldering, it would materially reduce the upkeep and renewals costs.

Passenger Accommodation

Wiring in passenger accommodation introduces fresh considerations, such as fire risks, obtrusiveness and reliability. Modern designs give more attention to the ready detection of fire than to its avoidance. It has to be admitted that practically all forms of insulation used for cables are highly inflammable, and although it is possible to have v.i.r. cables treated with fire-resisting paint, it cannot be said that they are fireproof. Furthermore, the application of any fire-resisting material, whether it be in the nature of paint or braiding, tends to increase the size of the cables and in some instances hardens them to such an extent that there is a definite danger of cracking the insulation when bending the cables acutely.

These facts regarding v.i.r. cables have induced a conviction in the minds of some superintendent engineers that lead-covered cables should be used throughout the accommodation as well as in other parts of their vessels. Other superintendents lean towards the conduit system, with v.i.r. cables drawn in, and it is the definite opinion of the writer that this is the most reliable and safe method. Here again there are difficulties to be overcome, but they have more to do with the finished appearance of the job.

So far as fire risk is concerned, practically the whole of the danger lies in the method of dealing with the ends of conduits where cables emerge. Should anything happen inside the conduit, either a definite "short" or "earth" will occur and thereby blow the safety fuse. If all fittings, switches and sockets were designed to be mounted on a conduit box so that the conduit terminated therein and no free wiring became exposed, the risk of fire would be negligible.

The cable passage on an up-to-date turbo-electric vessel

The architect does not want his decorative schemes intersected by cables. This means that cables must be concealed, which is the major difficulty of the shipbuilder. Unlike houses which have reasonably thick walls into which conduits can be sunk, ships' bulkheads are usually formed of plywood ¾in. thick, and even in panelled rooms there is practically no depth in which to conceal piping.

In a modern two-berth suite there may be as many as two dozen points at which cables have to emerge to cater for ceiling and wall lights, berth lights, bed-head switches, fans, curling-tong sockets, and radiator points.

In Favour of Conduits

I am of the opinion that in ordinary cabins—that is, where the bulkheads are plain—the conduit system should be so developed that it may be fitted on the surface and still not be unsightly. In public rooms and suites where panelling obtains, the design should allow space behind the panels for the conduit system and so contribute towards a safe and reliable installation. Also in all conduit work there should be no question about the capacity of the pipes being large enough to allow of the cables being drawn in easily from point to point and thus making renewals a simple matter.

With regard to renewals and upkeep, there can be little doubt that a conduit system with v.i.r. cables drawn in is infinitely the simplest scheme for maintenance. Lead-covered cables clipped on the surface and enamelled can never be disturbed or renewed without entailing an undue amount of work facing up the bulkheads and re-enamelling. In addition, lead-covered cables require expert handling if they are to have a neat finished appearance. Apart from Admiralty work, few shipping companies adopt this form of wiring in accommodation, which means that the men trained to this class of work are comparatively few. On the other hand, v.i.r. cable in conduit has been a recognised method of wiring shore installations for so long that all electricians must have experience of this work.

The illustration, reproduced by permission of the British

Thomson-Houston Co., Ltd., Rugby, serves to show how well cables may be run when special provision of space is made for them. This is the cable passage in a modern turbo-electric vessel, the propulsion machinery of which was supplied by the B.T.-H. Co. It clearly shows the main propulsion cables secured overhead in hardwood cleats, and sub-mains clipped to perforated sheet metal trays on each side of the passage. This is a particularly good example of cable layout when given sufficient space.

It will be seen that in the propulsion cables overhead a distinct "S" bend occurs near the middle of the run; this was designed to allow for expansion due to internal heating of the cables, since the overall run was about 80ft. in a direct line, and the cables, being each of 1¼ sq. in. section copper, would naturally tend to elongate with a rise in temperature. Observation made during the course of trials disclosed that the cables did actually "breathe" at this point to the extent of ¼ in. to ½ in.

Mine Motor Ventilation. By A. R. Cooper, A.M.I.E.E.

Methods of disposing of heated air

MOST of the larger motors used in coal mines for pumps and main haulages which are situated near the shaft bottom are of the enclosed, ventilated type in order to keep their capital cost and overall dimensions as low as possible. These machines usually deliver about 10 cu. ft. of cooling air per minute for each watt of their continuous rating, and it is essential that the delivery of this air should be suitably controlled in order to avoid overheating of the motors, and also to ensure that the normal flow of ventilating air in the mine is not interfered with.

Wherever possible, the delivery of hot air from a motor should be in the same direction as the normal current of ventilating air, and the disposition of the machines should be such that the hot-air delivery of one machine cannot enter the inlet of another. With motors driving centrifugal pumps, the air delivery should be towards the pump so that water from leaky glands or joints will not be pulled into the machine.

Fig. 1.—Chemical "smoke" for testing motor ventilation

When a number of large machines are working in the same underground engine-room, heating effects sometimes develop from causes which are difficult to locate, and the path of the delivery air must be traced from each machine to find out whether air is re-circulating. This would be a simple matter above ground, as the smoke from a piece of smouldering waste indicates exactly the direction in which the air currents are travelling.

As smouldering waste cannot be used underground, some other method of making air currents visible must be adopted. An anemometer is not very suitable for this purpose, as it behaves in a rather erratic manner in the pressure of eddying air currents, but a safe and satisfactory white smoke can be produced without the generation of heat by allowing the fumes from ammonium hydroxide and hydrochloric acid to mingle. If the stoppers are removed from a bottle of each liquid and the bottle mouths held close together or, alternatively, if two pieces of waste are soaked, one in each liquid, and held together, a white "smoke" will be given off, as shown in fig. 1.

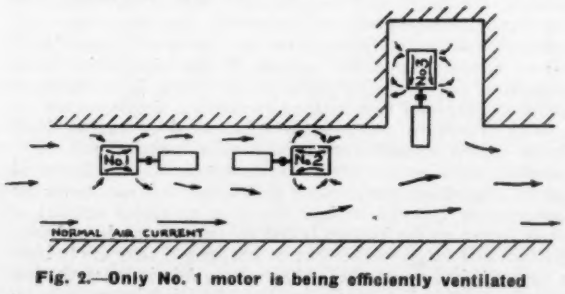


Fig. 2.—Only No. 1 motor is being efficiently ventilated

I have used an indicator of this nature to locate the causes of overheating in an underground pumping installation in which three 550-h.p. pump motors, each delivering 3,700 cu. ft. of cooling air per minute, were working in the same pump house. The arrangement of the motors was as shown in fig. 2, which indicates that only No. 1 machine was being efficiently ventilated. Hot air from this machine, together with that discharged from No. 2 machine, was finding its way into the air inlet of the latter, the continued re-circulation of air causing its temperature to rise to a dangerous value.

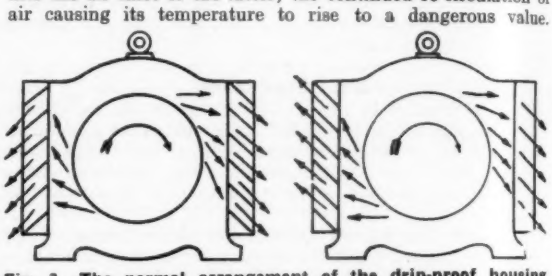


Fig. 3.—The normal arrangement of the drip-proof housing (left) and with one louvre reversed

The hot-air discharge from No. 3 motor was reflected from the walls of the pump house in such a manner that re-circulation was also taking place with this machine and causing excessive temperature rise.

Another factor which tended to raise the temperature of these machines was the shape of their drip-proof housings. From fig. 3 it will be seen that the delivery of air from one side of each machine was not unduly restricted, but on the opposite side the vanes of the drip-proof louvre were set almost at right-angles to the stream of delivery air. Reversing this louvre removed the baffle from the air delivery, but also destroyed its value as a drip-proof guard. As, however, the pump-house roof was quite dry, drip-proof protection was not absolutely necessary.

Some engineers find it advisable to fit their motor louvres with hinged flaps which open under the pressure of the air delivery when the machine is started, and automatically close when the machine is shut down.

As the normal ventilating air in the pump-house was return mine air with a high ambient temperature, the heating trouble caused by re-circulation was dealt with by fitting an electrically driven fan some fifty yards away in a roadway that was ventilated by cool intake air (fig. 4). The delivery air from this fan was fed through canvas ducting into the pump-house where it was diverted, in suitable proportions, to machines 2 and 3.

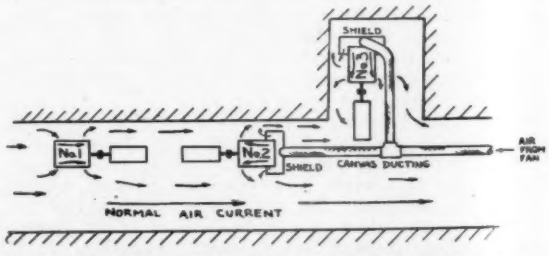


Fig. 4.—A method of preventing heating by re-circulation

Removable steel boxes were mounted round the inlet ends of each machine and the air ducting was connected to the top covers, sufficient excess air being provided to ensure that a slight pressure existed in each box. Baffles were also arranged to direct the hot-air deliveries away from the inlet ends of each machine.

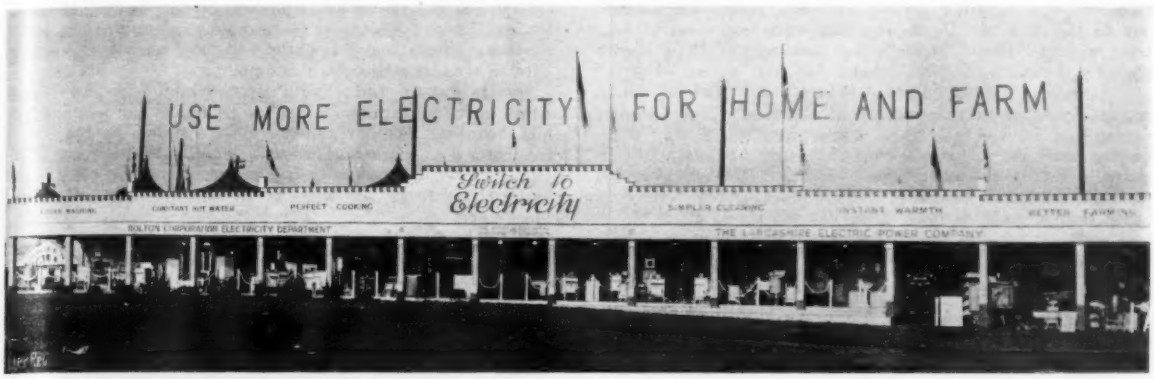
These measures were quite effective. The temperatures of the machines were reduced to a safe value, and bearing trouble which had previously existed was practically eliminated.

The method of smoke production used in this instance should be capable of extensive application in coal mines as it will indicate clearly and with perfect safety the path of air currents in mine roadways and coal-face workings.

Electricity for Farm and Homestead

The Royal Lancashire Show

AT the principal agricultural shows this year there have already been displays of electrical apparatus in excess of previous years, and the published reports indicate that these exhibits have been more comprehensive and interesting to the public than hitherto. For some years past electricity supply authorities in whose areas agricultural shows have been held have made highly creditable exhibits of electrical apparatus suitable for use on the farm and in the homestead. It would now appear that the efforts which have been made in the past to popularise the use of electricity in rural areas are bearing fruit, and it may be expected that at no distant date the electrical displays at these shows will be amongst the most interesting exhibits from the public's point of view.


USE MORE ELECTRICITY FOR HOME AND FARM
Switch to Electricity
BOLTON CORPORATION ELECTRICITY DEPARTMENT
THE LANCASHIRE ELECTRIC POWER COMPANY

A general view of the combined stand of the Bolton Electricity Department, E.D.A., and the Lancashire Electric Power Co.

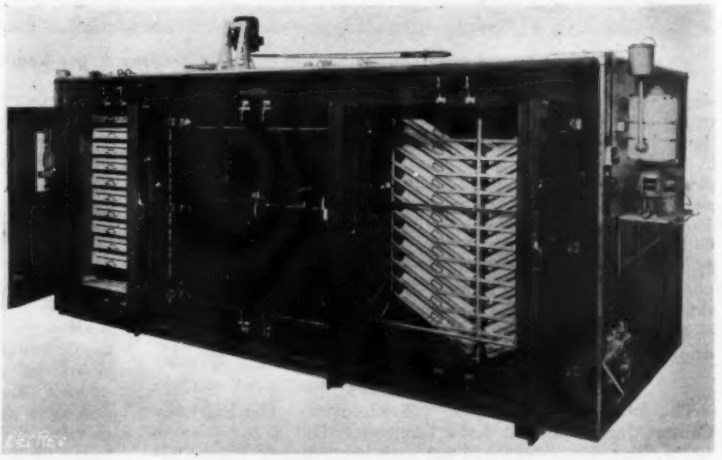
For several years there has been a good electrical display at the Royal Lancashire Agricultural Show, and those who regularly visit the show now expect to see a good display. At the Bolton Show, held from August 2nd to 6th, the main electrical interest centred upon the combined stand of the Bolton Corporation Electricity Department, the Lancashire Electric Power Co., and the British Electrical Development Association, and anyone who visited the show with a desire to obtain information on any of the problems associated with the application of electricity to agriculture or in rural life were well catered for. The combined stand was 150 ft. long by 16 ft. wide. The Electrical Development Association occupied 10 ft. in the centre and the Corporation and the company each had 70 ft. frontage. Over the full length of the stand suspended high up on wire were large single letters which could be seen from most parts of the showground—"Use More Electricity for House and Farm."

The electrical industry is aware of the energetic and enterprising policy which Mr. C. D. Taite has adopted on behalf of the Lancashire Electric Power Company, which is supplying electricity to approximately 400 farms, and here Mr. Taite put up a show of apparatus to demonstrate the great utility of electricity for rural and agricultural purposes which could not fail to interest those in his company's rural area.

One of Blake's self-oiling double-acting piston pumps (250 gal. per hr. against a head up to 300 ft.)

While Mr. Annett, the engineer and manager of the Bolton Corporation Electricity Department, may not be as well known for his work in providing supplies of electricity to those residing in rural areas, he also for some time has been actively engaged in fostering the use of electricity for agricultural purposes, and the display which he made on behalf of the Corporation was particularly attractive and valuable, and with the British Electrical Development Association showing striking posters and useful literature sandwiched between the Corporation and company the stand worthily represented the electricity supply industry, and provided a good example of the sort of co-operation which will do much to produce a lasting effect upon the public mind.

The company's part of the stand was divided into three main sections. The great development in poultry farming in Lancashire is now well known, and it was to be expected that considerable space would be devoted to apparatus for this purpose. This was successfully demonstrated by a mammoth electric incubator, battery brooders, and G.E.C. radiant electric and other hovers and egg testers. This section also contained examples of electric motive power, including G.E.C. portable drum and skid types of motors, slippers, groomers, water pumps, churns, barn machinery, &c.



The Stephens 24,000-egg all-electric incubator

The next portion of the stand was laid out as a modern electric bathroom, equipped with the usual cupboard containing a water cylinder converted to electric heating by the insertion of an immersion heater, a hand basin with a 1½-gallon hot-water storage tank; over the bath a "Santon" electric shower spray; an electrically heated towel rail; an illuminated shaving mirror; architectural strip lighting surrounding a dressing mirror; and a heater attached to the ceiling and pendant lighting, all attractively arranged, made a very pleasing exhibit.

The third portion was occupied by a useful assortment of domestic appliances, including several sizes of cookers, washboilers, washing machines, refrigerators, vacuum cleaners and water tanks in use and demonstrated continually; a considerable variety of moderately priced fires, kettles, grills, fans, irons and kitchen and cleaning appliances were on view.

The Corporation section of the stand, by arrangement with the Lancashire Electric Power Company, was mainly devoted to the display and demonstration of domestic electrical apparatus, and a very attractive and varied show was made. The selection of fittings and "Magicoal" fires, with baskets of flowers hanging from the stand and boxes of flowers on the ground, made a fitting contrast and gave a delightful domestic setting to the heavier appliances and to the attendant giving demonstrations.

There is nothing like an animated demonstration to stop a passer-by and convince people, and this policy was carried out to the utmost. Demonstrations were going on all the time with a "Bray" water-heater making a pleasing centre piece for the stand, "Creda" and "Jackson" ovens, "Burco" and "Simister" water boilers, "Beatty" and "Servis" washing machines, an electric wringer, an electrically heated clothes drying cabinet, a G.E.C. bread baking oven, a "Rotax" cake-mixing machine, a "Hovis" bread mixing machine, "Frigidaire" and "Prestcold" refrigerators, "Hoover" vacuum cleaners, a kitchen culinaire, chicken-plucking and numerous other things, such as fans, fires, kettles, irons, &c.

It was gratifying to find that approximately thirty exhibitors had accepted the Corporation's offer to supply exhibitors with electricity. This had the effect of spreading the use of electricity over a large area of the show and materially increased the publicity given to electricity; it involved the Corporation in the erection of about 2½ miles of overhead lines. It also demonstrated that many exhibitors realised that the apparatus used for agricultural purposes, when operated by electricity, imparts added interest to the exhibit, especially in connection with demonstrating machinery, incubators, egg testers, milkers, milk coolers, separators, churns, bottle washers, water pumping, clippers and shearers. These exhibitors mainly used the Corporation's supply for demonstrating appliances in use, electrical signs, and for providing their customers with hot drinks.

The farm equipment and domestic sections of the Lancashire Power Co.'s display

Other Exhibitors

The following were among the exhibitors: The Stephens Cabinet Incubator Co., Ltd., Gloucester, had a stand about 100 ft. long, beautifully laid out with incubators of from 1,000 to 24,000 eggs capacity. Messrs. Sykes & Dyson, Ltd., Huddersfield, had a useful display of electric refrigerators, washing machines and wash boilers, and on this stand Mr. G. T. Wragg exhibited liquid-fed brushes for washing buses, cars, floors, windows and the like, white-washing and creosoting. The method adopted is an electrically driven pump pumping liquid into a chamber from which the liquid is taken under pressure by one or more flexible pipes or hoses, at the end of which is attached a brush or broom with about ten liquid outlets amongst the bristles. Messrs. J. Blake, Ltd., Clayton-le-Moors, showed a range of pumps from 240 gallons per hour and upwards of the self-oiling double acting piston type, fitted with electric motors. Messrs. J. Bannet & Sons, Preston, exhibited poultry house equipment, including incubators ranging from 500 to 26,000 eggs, and a new type of egg grader at a moderate price. The Engineering Services Co., Bolton, had a display of electric washing machines, cookers, vacuum cleaners, water heaters and the usual domestic appliances, which no doubt interested a large number of visitors. Messrs. E. O. Walker, Manchester, exhibited "Kelvinator" refrigerators, milk coolers and ice-cream chests, and Frigidaire, Ltd., had a somewhat similar exhibit of their well-known designs.

Spratts Patent, Ltd., had a large exhibit of poultry appliances including Hearson's incubators, foster mothers and battery brooders. Similar appliances were shown by the Secura Incubator Co., Carlisle. Messrs. Drape & Short, Ltd., Hull, demonstrated "Ethylor" refrigerators and milk-cooling plant, electric sterilisers as well as bottle washing and filling machinery.

The exhibit of the Bolton Corporation Gas Department took the form of a bungalow on a somewhat isolated site, and a few yards away an open shed containing a gas engine driving a 4.37-kW dynamo lighting a bank of twenty-five lamps. The object of this exhibit was to induce people to generate their own electricity. This made an attractive display, otherwise the bungalow appeared to be quite dead, but inside in almost every instance the gas appliances exhibited were complementary to electrical apparatus, inasmuch as each piece of apparatus was an attempt to produce gas apparatus which it was difficult from outward and visible signs to distinguish from their electrical prototypes—surely a highly flattering compliment to electricity.

Although it is not possible to assess the benefit of the electrical exhibits at agricultural shows there is abundant evidence of interest in the use of electricity by all classes of the community. Instances frequently occur which point to the existence of more than a casual desire on the part of country folk to know about the services to be obtained from electricity provided by a public supply authority.

If this be the case then it is worth while, for no other reason, for supply authorities, large and small and in urban and rural areas, to regard it as fundamental for the successful development of their undertakings to take advantage of the opportunities offered to display and demonstrate to these communities the manifold benefits it is possible for them to derive from the electric service which is now so extensively spread over this country.

Hams Hall Station Extensions

LAST winter the maximum demand on the Birmingham system was 195,000 kW. With an annual increment of only 12,000 kW this will approximately equal the present effective plant capacity in 1935-36 (Hams Hall, 60,000, Nechells Prince's 108,000, Nechells Temporary 12,000, Summer Lane 40,000, total 220,000). A third 30,000-kW turbo-alternator was installed in 1930 at Hams Hall to facilitate the frequency change-over, but without the requisite boilers to enable it to be normally effective.

The Central Electricity Board has now approved the installation of such boilers as may be necessary for this set and for a new 50,000-kW set to bring the effective capacity of the station to 140,000 kW. Nechells Temporary and Summer Lane stations are to be closed, so the total generating capacity of the Corporation will be 248,000 kW. The rate of growth of the undertaking is such as to indicate that further extensions will be needed in the near future.

The total estimated expenditure involved in the foregoing proposals is as follows:—One 50,000-kW turbo-alternator, three 250,000 lb. per hour boilers, coal and ash handling plant, pipework and valves, £530,300; buildings, foundations and civil engineering works, including cooling tower and pond, and railway sidings, £161,600; main switchgear transformers and cable work in station, £125,000; secondary switchgear and work at the sub-stations, £10,000; and trunk feeders from Hams Hall to sub-stations, £177,000. The total estimated cost, including 5 per cent. for contingencies, is thus £1,054,100.

The Cinema Rectifier. By W. Woodiwiss, A.M.I.E.E.

Important points for purchasers

THE changing over of d.c. distribution systems to a.c. has caused, and will continue to necessitate, the installation of rectifiers in many towns. One firm alone has this year installed twenty-one rectifier outfits in fourteen weeks.

Good film projection requires a quiet steady arc light, and if the arc supply is obtained from a rectifier the rectified current should not pulsate. There are a variety of rectifying circuits which give varying degrees of smoothness of rectified current. Fig. 1, for instance, shows the form of output from two different systems, and obviously indicates that three-phase supply with three-phase rectification is to be preferred.

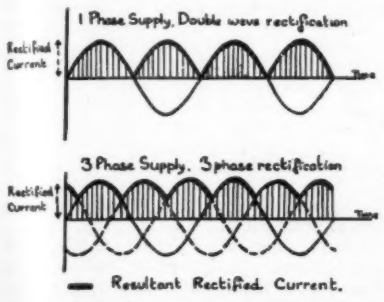


Fig. 1.—Alternative systems of rectification

Throughout a performance two cinematograph projectors are used alternatively, and when changing over from one machine to the other both machines must operate together. If the change-over is to be effected without darkening the picture on the screen, each arc must have its normal current when both are burning. This means that when the load on the rectifier is increased from one arc to two its output voltage must not fall by any great amount.

The drop in a mercury vapour rectifying bulb is approximately constant at 15 V, and any drop in output voltage when the extra arc is struck is due to the transformer. This phenomenon of diminishing output voltage with increasing load is technically referred to as regulation. Any good make of rectifier equipment will not drop its output pressure by more than 3 or 4 V during change-overs, and this is not sufficient to cause darkening on the screen.

In the average suburban cinema with a projection throw of 90 ft. each mirror arc takes 25 A, making a total of 50 A during change-over periods. Although the pressure drop across the carbons is 45 V, allowance has to be made for the arc regulating resistance which allows the arc current to be increased to 30 A for coloured or heavy films and to be reduced to 20 A for thin films, and at the normal current it will usually absorb 45 V. Thus, the arcs and resistances require 90 V and 50 A or 4.5 kW. A rectifier equipment of this capacity should be well capable of handling its load continuously without excessive rise in temperature, or rapid deterioration, since it is only during the change-over period that it is operating at its rated full load.

The rectifier must not cause electrical interference with the talkie equipment, and consequently impose noises on the speech reproduction. A rectifier equipment is generally enclosed in a sheet metal cubicle to prevent it from being damaged, or doing damage by virtue of exposed live terminals. If the cubicle is efficiently earthed when the equipment is installed it will probably effect the screening necessary to eliminate any interference and, incidentally, make the cubicle safe.

A rectifier can cause direct acoustic interference not to be tolerated. The main power transformer may give out a low, dismal 50-cycle note if its core laminations are not firmly clamped; contactors or, in large rectifier units, cooling fans, may cause quite irritating noises if incorrectly designed. It is essential that the equipment as a whole should be absolutely silent in operation.

The higher efficiency of the rectifier as compared with other conversion methods makes possible economies in power consumption. The following comparison between a rectifier and a motor generator shows the savings that can be expected in a cinema running matinee shows daily. It is assumed that each week its conversion plant will run at full load for 12 hours at 50 A at 90 V, 54 kWh; at half load for 36 hours at 25 A at 90 V, 81 kWh.

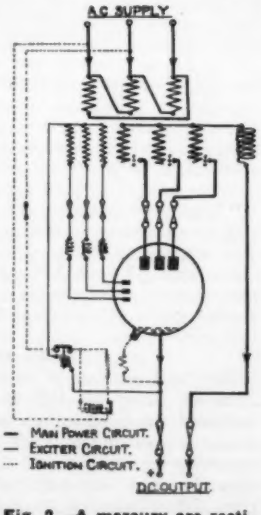


Fig. 2.—A mercury arc rectifier circuit

	Rectifier.	Motor generator.
Efficiency, full load	75	70
,, half load	80	60
Units taken, full load	72	77
,, ,, half load	101	135
Total kWh. per week	173	212

From this comparison it will be seen that the rectifier saves 39 kWh a week, or 2,028 kWh per annum. An allowance should be made for rectifier bulb replacement.

In the case of mercury-arc rectifiers, the life of the bulb has been greatly increased by improved methods of anode sealing; bulb failure due to thermal strains has been eliminated by the use of 85 per cent. quartz glass for the bulb, which bulb is now a very reliable unit and is generally guaranteed to have a burning life of 10,000 hours. Oxide cathode rectifier valves are guaranteed for 2,500 hours. They cost about one-eighth of the equivalent mercury bulb, but since three of them are used simultaneously their maintenance cost is higher.

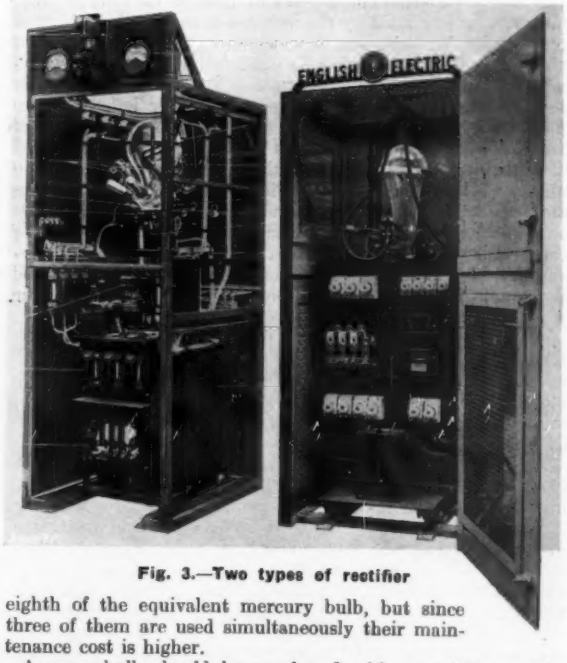


Fig. 3.—Two types of rectifier

A spare bulb should be purchased with a rectifier and it should be actually tried out when the rectifier is installed. When testing, the time taken in dismantling the spare bulb in the cubicle and fitting it should be noted, and this should not exceed ten minutes. If a valve fails in an oxide cathode rectifier the remaining two valves carry the load until the end of the reel, and thus prevent any interruption of the performance.

In mercury-arc bulbs an ignition device is incorporated by which a small initial arc is struck to ionise the tube and facilitate the striking of the main arc. Since failure of the ignition system makes it impossible to put the bulb into operation this ignition system should be positive in action, simple, and durable. Three different methods are used, namely, the pinch effect, by which electro-magnetic repulsion forces break a mercury bridge and initiate the arc; a solenoid external to the bulb operates on a flexible starting anode in the bulb and, by withdrawing it from the mercury, starts an arc; and a bimetal strip heated by an electric current bends and lifts a contact out of the mercury.

Cinema rectifiers should comply with the I.E.E. Regulations for the Electrical Equipment of Buildings, with the Electricity Supply Regulations, with the regulations of the local authority, and with the requirements of the fire insurance company. This compliance with the regulations should be ascertained before contracts are made, since subsequent modifications may prove troublesome and expensive.

Since the rectifier will preferably be in a room separate from, but adjacent to, the projection room there is not much

to be gained by having instruments on the cubicle. These should be in the projection room, so as to be visible to the operator. A red pilot lamp fed from the a.c. side and a green pilot lamp fed from the d.c. should prove useful indicators in the event of trouble.

The temperature rise in the rectifier cubicle is quite appreciable, and all internal cubicle wiring should have insulation that will not deteriorate at that temperature. The auxiliary circuit wiring ought to be neatly run on cleats and preferably should be placed low in the cubicle where the cooling air enters it.

A complete wiring diagram should be supplied with every rectifier. In the event of breakdown a competent local electrical engineer may be called in, and with the assistance of the wiring diagram he will be able to make tests quickly and repair any minor faults without delay.

Since the rectifier is air-cooled it soon accumulates dust in the cubicle and cleaning is one of the principal maintenance features. This is quickly and efficiently done when the gear in the cubicle is conveniently accessible, and particular attention should be paid to this point.

It is compulsory that a switch controlling the a.c. supply to the rectifier, preferably on some adjacent wall within two or three feet of the cubicle, should be readily available to cut off all supply to the cubicle. Locking of the cubicle is advisable, the chief operator having possession of the key with instructions to use the switch to cut off the supply before unlocking the cubicle.

The cinema rectifier, when correctly designed and manufactured, is simple, silent, static, efficient and thoroughly capable of fulfilling all its duties; it has been proved by experience to be thoroughly reliable.

The Factories Report

The Chief Inspector stresses the value of good lighting

THE 1933 report of H.M. Chief Inspector of Factories and Workshops, Mr. D. R. Wilson (H.M. Stationery Office, 2s. net), states that the tendency for industry to move southwards continued and was confirmed by the increase of factories registered in the central metropolitan and in the southern divisions. The growth of modern industry cannot, however, be estimated by the increase in the number of works registered. The tendency is to increase the size of the unit of manufacture rather than the number of units. In consequence, neither the increase in the numbers employed nor the increase in the work of inspection can be judged by the number of registered works. The reduction in the number of factories registered in some areas is the result of various forms of rationalisation. Increases in the size of the manufacturing unit are specially noticeable in industries such as the manufacture of gramophones and radio sets, motors and cycles and their auxiliary trades. One firm manufacturing motor cars employed 8,000 workers in 1932 and 15,000 in 1933—another, manufacturing gramophones and radio sets, increased the number of its employés from 5,000 to 10,000 during the year.

At the end of the year reviewed there were 160,185 factories and 86,851 workshops on the registers of the Department, an increase of 2,294 factories and a decrease of 4,008 workshops compared with the previous year. The number of premises of all kinds subject to inspection amounted to 285,284.

Expanding trade tended towards increased use of electricity in factories, and in the steel industry the electric driving of rolling mills of large output has been a prominent feature, while on the melting and refining side there has been an expansion in the use and size of electric furnaces, especially of the high-frequency type. There has also been electrical drive development in the textile trade, although there is competition from the steam turbine which also gives a turning movement steadier than that of the reciprocating engines formerly in such common use. Electric arc welding has made great progress during recent years both in shipbuilding and in constructional engineering work.

Lighting Investigation

Illumination again received attention from the whole staff and, in addition, a special investigation, which was confined to the city of Sheffield, showed that in the larger factories the principal defect was glare and general unsuitability of the lighting system rather than inadequacy of the actual illumination. On the other hand, in the tenement and other small factories engaged in the silversmiths, cutlery, and allied trades, which are characteristic of Sheffield, lighting conditions have in many instances remained unchanged within living memory, and the use of batswing gas burners, and even of candles, is still usual.

In many cases, the report states, the fault seems to lie with the local lighting contractors who, not being lighting engineers, have no knowledge of scientific illumination and apply their ideas of house lighting to factory purposes; when lighting experts are called in the advantages are always apparent. Improvement is largely a matter of education, and factory occupiers have not been slow to respond when the facts have been brought forcibly before them.

The inquiry, in which the City Council showed great interest, has led to some remarkable results. Out of 475 factories visited only twenty-seven were found already to possess really up-to-date installations. In the remainder the recommendations made, following various tests and demonstrations by a direct reading photometer, have led to improved conditions, wholly or partly completed, in 128 factories, and in seventeen more similar progress is anticipated.

In the south of England, again, the lighting exhibit of the Home Office Industrial Museum is known to be the cause of considerable advance, and the lectures on lighting have been advantageous in many parts of the country.

A large steelworks has adopted an ingenious system of lighting in an effort to reduce traffic accidents where a number of doorways open directly on to the permanent way. The source of light is focused to illuminate the full length of the permanent way along this series of doorways and at the far end impinges on a photo-electric cell. As an approaching engine or vehicle nears the doorways its intrusion cuts off the light beam from the cell. By the action of an intermediate relay, red danger signals at once glow in all doorways opening on to this particular length of track.

Gaseous-discharge Lamps in Industry

In the same works " Osira " gaseous-discharge general units, providing a floor illumination of eight foot-candles, are controlled through relays by photo-electric cells in two circuits. As daylight fades the lighting is automatically switched on in two stages.

The newer inspection pits in garages have a series of reflector lights along each side of the pit. Armour-plate glass is cemented into the fittings, and these are said to be flame-proof, the whole of the underside of the chassis being amply illuminated. All the light is concentrated on the work and any danger from hand-lamps is eliminated.

Improvements in lighting have been noted in the introduction of floodlighting in a large construction engineering works and in the fitting of lamps on the underside of overhead cranes to bring the light over the spot where it is wanted as the crane moves about. The use of frosted-glass lights of large area has been found most satisfactory in producing a strong shadowless light in all parts of a modern power station, where good general lighting is essential for the reading of the numerous recording instruments.

Lighting by gaseous-discharge lamps is making some headway in industrial undertakings. All reports so far refer to the mercury type of lamp. This method of lighting has been found in the following industries: iron foundries and steel smelting shops, loading bays and outside road lighting, composing rooms of newspaper works, knitting of expensive silk stockings, special examination processes as an alternative to daylight for matchings, examination of sheet and plate glass, and the testing of razor blades. Some complaints have come from the workers, apparently due to the effect on their own appearance because they are all willing to admit an improvement as far as the work is concerned.

" Daylight " bulbs were found in use in many silversmiths and electro-plating works, particularly for the buffing process. The lighting of file-cutting and certain other machines by low voltage (12 V 18 W) local points proved to be very successful. For the inspection of safety razor blades both mercury-vapour and daylight lamps have been installed.

Safety and Accidents

The total number of accidents reported during the year increased from 106,164 to 113,260, and the fatalities also increased from 602 to 688. Probably the rise in the number is not wholly due to more extensive employment. Workers returning to employment, often after long periods of enforced unemployment, are physically and mentally less alert and more liable to mishap than in normal times, though working conditions are of a much higher standard and more precautions

are taken by employers and workers alike than at any time in our industrial history.

Generation and Use of Electricity

The electrical accidents reportable under the Acts numbered 346, and of these twenty-five were fatal, the total figures again being well below the five-year average, although the proportion of fatal accidents is slightly higher. There were forty-one accidents (seventeen fatal) notified which were found to be not reportable; and, in addition, forty-nine electrical fatalities in places other than factory premises came unofficially to the knowledge of the Factory Department, the total known fatalities due to electricity, therefore, being ninety-one, as against seventy last year. Twenty-one of these fatalities appear to have occurred on premises of a domestic character, of which fourteen were due to the use of defective portable apparatus, seven cases being in bathrooms.

Prosecution was undertaken in seven instances, as compared with sixteen cases during the previous year. Two cases were dismissed, one on payment of costs. A common law action arose on a case taken in 1932 as a result of which the widow of a man killed when using a non-earthed brass lampholder was awarded £900.

In looking back over a ten years' record of accidents, a point of significance is the almost stationary annual number of accidents occurring on factory premises as compared with the large increase in the general use of electricity (132 per cent. increase in kWh sold by authorised undertakings), and with the increase of factories under the Electricity Regulations from 72,820 in 1923 to 127,756 in 1933. These data appear to indicate that a steady annual figure may have been reached and that the possibility of reduction lies more in the appreciation of danger by those in possession of technical knowledge, i.e., the skilled person, rather than in the design of the apparatus handled.

Out of the total of 140 accidents that occurred to skilled persons many were avoidable, whereas accidents to electrically unskilled persons were not, as a rule, preventable in the sense that the responsibility attached to the injured or deceased party, since he or she frequently acted in ignorance or was the victim of defective apparatus, installation, or maintenance for which the skilled person or a person in authority was responsible.

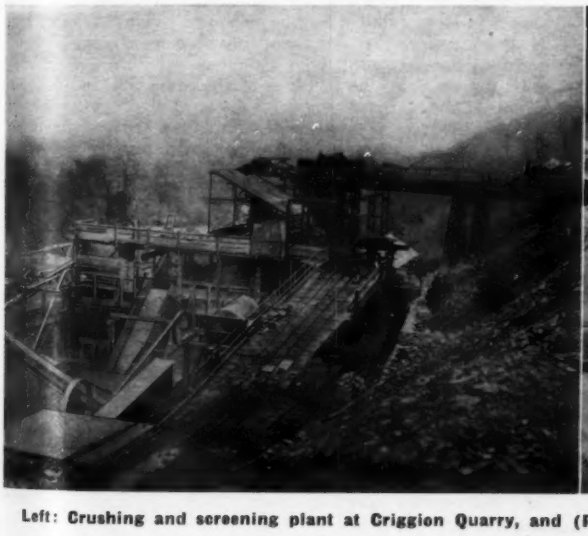
An explosion of coal dust occurred at a pulverised-fuel plant in an electric power station, resulting in injuries to six men and extensive damage to the plant. Ignition most likely was due to overheating of a pocket of coal dust in one of the pipes and consequent ignition of the dust cloud in the almost empty hopper by a portion of incandescent material blown over with the air current. There was a safety vent on the cyclone above the hopper, but this was not sufficient to relieve the explosion which occurred in the hopper.

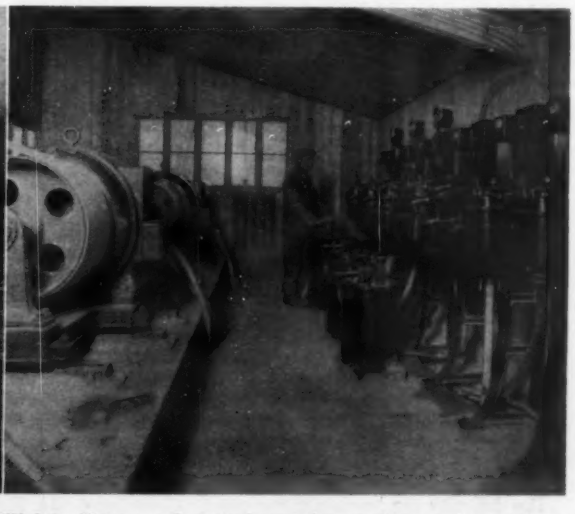
A Granite Quarry

Heavy electrical plant for crushing and handling

NEAR the Shrewsbury-Welshpool road towards the Welsh border is Admiral Rodney's pillar surmounting the 1,200-ft. Breidden Hill, close to Criggion, where one of the granite quarries of the British Quarrying Co., Ltd., is situated, producing about 800 tons of road metal per week.

Electric power is supplied at 11 kV by the North Wales Power Company, and in the quarry sub-station a 500-kVA step-down transformer feeds an Ellison power distribution





Left: Crushing and screening plant at Criggion Quarry, and (Right): Motors and control gear for crushing and screening

switchboard at 400 V, 50 cycles, 3 phase. A 700-A circuit-breaker controls the supply from the l.v. side of the transformer, and a second circuit-breaker of the same size protects the feeder to a starter switchboard on the crushing plant. Four further circuit-breakers on this main board supply the tarmacadam plant, compressor house, repair shop and lighting circuits. Watt-hour meters mounted on the switchboard record the consumption on the three last-named power circuits, and transmission from the sub-station to the various drives in the quarry is by 3-core d.w.a. cable. The motors range in size from 30 to 135 h.p., and are all of Crompton Parkinson manufacture with Ellison control gear.

Pneumatic rock drills are used to bore blasting holes in the quarry face from which pieces of granite up to 7 tons in weight are often dislodged. These pieces are again drilled for further blasting until they are of a size more convenient to handle. The drills are fed by an Ingersoll Rand compressor driven by a 60-h.p. slipring motor. The main driving motors and the control gear for the crushing and screening plant are housed in a separate building, the motors being mounted in line on one side and the switchgear along the other; the whole of the crushing and screening plant can thus be started in sequence from this point.

The feeder cable from the sub-station switchboard is connected direct to the bus-bars of the starter switchboard, and three of the circuit-breakers on this board are mechanically and electrically interlocked with oil-cooled rotor starters for motors driving the crushers. Other circuit-breakers on the board control power to conveyor and screen motors, and a 40-A d.p. breaker connected across phase and neutral protects the lighting circuits. Separate watt-hour meters for each power circuit are mounted on the switchboard.

Crushers of various types are used to reduce the rock to graded sizes. A 125-h.p. motor drives two 24in.×12in. crushers, three sets of roll crushers and elevators for taking the crushed rock to the screens. A 36in.×24in. crusher of the sledger type made by Messrs. Broadbent is driven by a 100-h.p. motor, and two 24in.×12in. secondary crushers, also of Broadbent manufacture, are driven by an 80-h.p. motor. The largest motor on the plant, a 135-h.p. machine, drives one 3-ft. cone and two 20in.×6in. Hadfield crushers, a scalping screen and the conveyors which carry material to the four vibrating screens. Conveyors receive the graded rock and deliver it into appropriate bins from which the material is drawn off for loading into motor lorries or railway trucks. A part of the granite is taken to the tarmacadam plant where a 50-h.p. motor drives machinery capable of an output of 100 tons of tarred granite per day.

Brushes for High-speed Machines. By J. F. Romer

CARBON brushes used on high-speed machines have a tendency to chatter. The difficulty of maintaining contact was responsible for the abandonment of the d.c. turbo-dynamo and it is likely that variations of contact resistance have been the cause, in some cases, of instability of the excitation of turbo-alternators.

In the absence of vibration and eccentricity, satisfactory contact can be maintained and the amplitude of any vibration greatly reduced by securely bolting the machine to a very heavy concrete block, but this is impossible in the case of traction motors or on board ship. It is practically impossible to make a machine which will be permanently well-balanced, or a commutator which will not develop some eccentricity after long running.

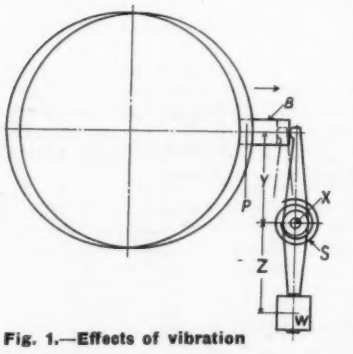


Fig. 1.—Effects of vibration

As an example of the effect of vibration, let us consider a carbon brush working as shown in fig. 1, the two extreme positions of the vibrating machine being represented by the two circles. When a swing takes place in the direction of the arrow the brush B will be accelerated and will attain its maximum velocity when passing the mean position P. The machine will then decelerate, but the brush cannot do so without the kinetic energy which has been imparted to it being absorbed. This can only occur by the brush spring being compressed, *i.e.*, the brush must break contact. If the length of break does not exceed 0.0001 in. current will pass by a short arc and little trouble will be caused, but if it exceeds this length sparking and the production of flats will occur.

If, for example, the brush is 1 in. square by 2 in. long with a specific gravity of 2.2 its mass will be approximately 0.005 units. If the machine vibrates with an amplitude of 0.01 in. on either side of the mean position at a speed of 600 r.p.m., the maximum velocity of the brush will be that of a point travelling with a uniform velocity on the circumference of a circle of 0.02 in. diameter, or 0.0524 ft. per second. At this velocity the kinetic energy of the brush is 0.00000685 ft.-lb. If the spring pressure is 2 lb. the kinetic energy of the brush will be absorbed by compressing the spring 0.0000411 in.—well within the permissible limit, but if the speed of the machine is 3,000 r.p.m. the kinetic energy will be 0.0001714 ft.-lb., and the brush contact break will be 0.00103 in. long, and this will cause serious sparking. In practice the conditions would be somewhat worse, as the brush would have a heavy flexible which would nearly double the total mass. To bring the length of break within the permissible limit, the total pressure on the brush would have to be increased to 20 lb., or if the pressure per sq. in. remained the same, the length of the brush would have to be reduced to 0.2 in. In the first case the brush would soon become red hot and fall to pieces, while in the second case the useful life would be negligible.

A Counterweight Method

The difficulty can be simply overcome. If the brush (fig. 1) is held down by a lever pivoted at X, having attached to the other end a counterweight W exactly equal to the weight of the brush, then if the arms Y and Z are also equal the moments of inertia of the two masses about the point X will be equal, and any tendency of the brush to move outwards through vibration will be exactly neutralised by the counterweight. It is assumed that the lever is rigid and that the fulcrum X is firmly attached to the frame of the machine.

Under these conditions the kinetic energy of brush and counterweight would be absorbed in elastic flexure of the brush rocker, but this bending can be made very small. The brush is pressed on to the commutator by a spring S, which is in such a position that it is unaffected by vibration and, therefore, the pressure which it exerts on the brush is normal and invariable. In the example oscillations in a horizontal plane only have been considered. Actually, a rotating out of balance mass would cause circular vibration, but if the moments of inertia of brush and counterweight are equal they will balance each other against vibration in every direction.

As in all cases the modern practice is to grind slip rings and commutators true when in position on the machine, there will be no eccentricity at the start, but unequal expansion and contraction may cause it to develop, especially on a commutator which is long in proportion to its diameter. The effect of eccentricity is to cause the brush to execute in its holder a simple harmonic motion which may be at any phase angle to that produced by vibration and may or may not be of the same amplitude.

In the rare case in which the displacements due to eccentricity and vibration are of equal amplitude and in phase opposition, the effects will cancel each other and perfect contact can be obtained on a vibrating machine with ordinary brush holders, the brushes remaining fixed in space. As the direction and amount of eccentricity can be easily ascertained, it is feasible to alter the position and size of the balance weights and deliberately produce vibration so as to bring about the effect described. This, however, could only be done on a machine having two sets of brushes diametrically opposite each other, as the amplitude of vibration is usually the maximum in a direction at right angles to the centre line of the pedestals, and varies considerably in other directions according to the elasticity of the machine and the weight of the foundation block.

Overcoming Vibration

Fig. 2 shows a commutator C which revolves eccentrically about the centre T. The brush B will, therefore, vibrate with an amplitude A, attaining its maximum velocity when passing the mean position P. If it is to maintain contact the kinetic energy which it acquires will have to be entirely changed to potential energy at the end of a swing, or the restoring force exerted by the brush spring must be proportional to the displacement from the mean position P. This is the condition necessary for the execution of a simple harmonic motion, the periodic time of which is $T = 2\pi \sqrt{\frac{\text{displacement A}}{\text{acceleration}}}$

The acceleration is f/m, where m is the mass of the brush and f the force necessary to displace it from the mean position. This means that the brush will maintain contact if the natural frequency of the brush, spring and pressure lever, regarded as a vibrating system, is equal to or greater than the frequency of displacement produced by the eccentricity; but this condition is seldom fulfilled by the ordinary brush holder, which is always designed so that the spring pressure remains sensibly constant over a considerable distance.

If, for example, the brush is of the same size and mass as in fig. 1, and if the spring is so designed that compressing it 0.75 in. produces a pressure of 2 lb., then the periodic time, neglecting the mass of the spring and pressure lever, is $T = 2\pi \sqrt{\frac{0.75}{12} \times \frac{0.005}{2}} = 0.0785$ second, or a frequency of 12.7 cycles per second. This would be satisfactory at 600 r.p.m., but would fail completely on the 3,000-r.p.m. machine. To maintain contact it would be necessary for the spring to exert a pressure of about 5 lb. when compressed a distance of 0.01 in. This gives a frequency of 55.2 cycles per second, but would be unsatisfactory, as the pressure would be too high and there would be practically no allowance for wear.

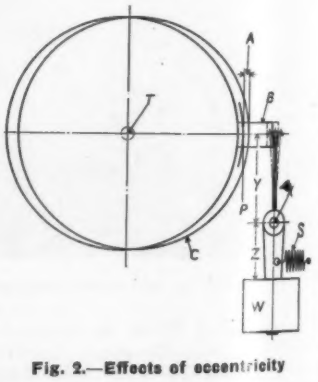


Fig. 2.—Effects of eccentricity

The difficulty can, however, be overcome in another way. The brush shown in fig. 2 is held down by a lever pivoted at X and having attached to the other end a weight W which is, say, twenty times as heavy as the brush. The arm Z is rigid and the arm Y is flexible. Pressure on the brush is maintained by the spring S. The inertia of the weight causes it to act like a fixed point, but allows contact to be maintained as the brush wears. The brush and flexible part of the lever form a vibrating system, and if the frequency is equal to, or greater than, that produced by the eccentricity the brush will bear continuously on the commutator.

Special interest attaches to the case in which the brush and eccentricity frequencies are equal. Under these conditions the brush may be said to be in tune or resonance with the commutator and contact can theoretically be maintained with no pressure other than that produced by the spring.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

The Cooker and the Kettle

I am in complete agreement with Mr. Fleming's defence of the *use* of the electric kettle. He, no doubt, voices the opinion of many people in a similar position. As a matter of fact I use an electric kettle myself.

I should, however, like to stress the point that electric cookers are no longer dependent on the electric kettle. Boiling plate efficiency is greater than it was and suitable utensils for boiling purposes are more generally in use. E. PURVIS.

London, S.W.1, *August 4th.*

I was pleased to read the letter by the burgh electrical engineer of Rothesay in reply to the criticisms levelled at the electric kettle by Miss Purvis, for it is universally acknowledged that an automatic safety kettle is one of the most useful and reliable of domestic electrical appliances to-day. Further, it is more economical to boil the water needed for any cooking in the kettle and then transfer the required quantity to the pan or pans which are to be placed on the hot plate.

As a result of careful tests of various heating and boiling apparatus, carried out under normal domestic conditions (not demonstration tests) I have found the efficiency of a 3-pint electric kettle, which has been in constant use for three years, to be 92.5 per cent., while an up-to-date boiling ring only gave an efficiency of 50.7 per cent. under equivalent conditions.

During the whole of my experience with domestic electrical appliances, which extends over many years, I have never had the slightest trouble with electric kettles, three of which are in daily use in my home. This speaks well for the particular manufacturers who have devoted time and thought to producing such a reliable and efficient utensil.

Prestwich, Manchester, *Aug. 6th.* NINA DYSON RAYNER.

Non-standard Voltages

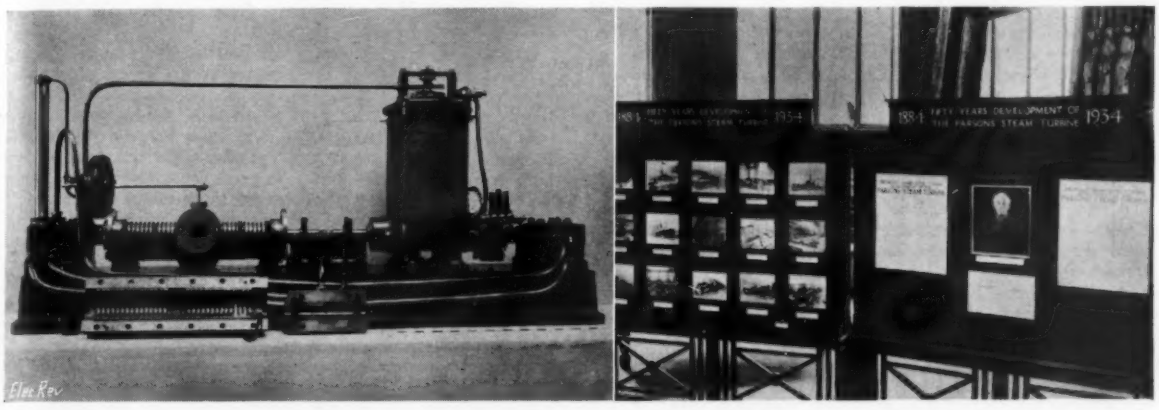
In your issue of December 8th, 1933, you published a leading article entitled "The Voltage Chaos," in which you called attention to the urgent necessity for voltage standardisation. You concluded with these words: "Not enough has been made of the importance of voltage standardisation in recent discussions on the co-ordination of distribution, but any legislative proposals that do not place the subject right in the foreground will fall short of their purpose."

I should have thought that the truth of these words was self-evident, but perhaps you may be able to inform me why it was necessary to provide a non-standard voltage for the new Empire Swimming Pool described in your issue of July 27th. In this I find that the low-voltage work is carried out at 415/240 V, so that this installation will apparently continue to demand non-standard lamps, &c., in perpetuity.

Is there any technical advantage in adopting this pressure against the standard 400/230 V? If so, have we standardised the wrong pressure? If there is no technical advantage, should not somebody hang for this? One can understand supply authorities going in for all sorts of cranky pressures, but here is a case where the consumer can have what pressure he likes, as he takes supply at high pressure, and apparently the consultants have saddled him with a non-standard pressure on the low-voltage side.

Too many large buildings have recently been the subject of similar treatment; how can we expect voltage standardisation if this sort of thing is permitted? T. C. GILBERT.

Folkestone, *July 31st.*



The first Parsons turbine and high-speed dynamo which are now on view at the Science Museum, South Kensington (See note on page 196)

The Grid Shut-down

Referring to the failure of the grid in S.E. England it is obvious that the gas industry will have no further need to advertise—the Central Electricity Board will do it for them.

Nelson, *August 7th.* J. BROWN.

Some of your readers who visited the Royal Agricultural Show at Bolton last week-end found themselves gratuitously favoured at the Gas Bungalow with reprints of newspaper reports regarding the failure of the electrical grid. Is this surprising? ONE OF THEM.

August 7th.

New Books

Automatic Street Traffic Signalling. By H. H. HARRISON and T. P. PRIEST. Pp. 187; figs. 150. London: Sir Isaac Pitman & Sons, Ltd. Price: 12s. 6d.

This book includes a great deal of sound matter in small compass. It covers not only the technical side of control in detail, with especial reference to the vehicle-actuated system, but also the general considerations governing traffic movement. The clear and accurate way in which the mechanical aspects are dealt with will commend it to electrical engineers, but, as Sir Henry Maybury suggests in his foreword, it will also be of great assistance to civil engineers and to public authorities.

Television To-day and To-morrow. By S. A. MOSELEY and H. J. BARTON CHAPPLE. Fourth Edition. Pp. 205; figs. 56. London: Sir Isaac Pitman & Sons, Ltd. Price: 7s. 6d.

Less than one year after the third edition of this book on television was published it became necessary to publish a fourth. So rapid is the progress that is being made in television that this state of affairs is quite likely to continue for some time to come. The cathode ray, and the rapidity, certainty and ease with which it can be made to sweep the entire surface of the fluorescent screen twenty-five times a second, has made the reproduction of light images far more satisfactory than it was before, while the use of ultra-short waves has solved the problem of crisp definition by allowing of infinitely finer sub-division of the original image. The relatively new, but highly important, development of televising cinematograph film pictures, either finished prints or pictures actually in the making, has been dealt with in a special chapter.

The authors have obviously had Mr. Baird's work first and foremost in their minds, and one cannot help wishing that in a book so admirably written rather more space had been devoted to the magnificent work that has been going on in Germany, America and other countries. "Television To-day and To-morrow" is clearly written and abundantly illustrated, and should be in the hands of all those interested in this new and still shy child of the electrical family.

Industrial Tariffs. By Utilisation Engineer

The effects of diversity and load-factor

WHILE it is easy to determine an economic value for the sale of current from the theoretical stand-point, insufficient data is available in regard to diversity and individual load-factors of various types of consumer to enable tariffs to be fixed except, to a great extent, on the hit-and-miss principle. It is usually safe to assume that the party to be hit will be the industrial consumer.

In the majority of cases where two-part tariffs are in operation the supply undertakings have to base their diversity on annual readings, first because their own maximum loads are an annual affair, and secondly because the maximum demand indicators of their industrial consumers are reset at the beginning of each year.

The result of taking such liberties with the definition of diversity in regard to the time element is to make the ratio appear better than it really is. Thus, assuming M is the station maximum load in December; A the sum of the individual maximum of certain consumers which occur during the summer months; *a* the demand of the same consumers during the winter months; and B the sum of the maximum demands made by the remaining consumers during the winter, then the diversity $= \frac{B+a}{M}$ which is less than $\frac{B+A}{M}$.

As $\frac{B+a}{M}$ is nearer to unity it would appear that either diversity is not so important as it is said to be, or else the charges to industrial consumers are higher than is warranted according to the diversity figures accepted by supply undertakings generally.

It will, perhaps, be pointed out that the diversity of industrial consumers is by no means the whole of the story since domestic consumers play an important part in improving the load conditions. On the other hand diversity among domestic consumers is a matter for speculation since, except for small groups of a dozen houses or so where individual records have been taken of consumers' load curves and compared with that of the sub-station supplying them, no information of any value is available. In these cases the diversity varies between 1.8 and 3, but they may be exceptional, as they only deal with one particular class of domestic consumer. In purely industrial areas where approximate figures are available the variation is between 1.2 and 1.8.

Wide Variations Possible

Energy charges can vary over a wide limit, *i.e.*, while Parliament has fixed the upper limit for the cost per kWh, the lower limit is at a point slightly above the cost of generation or bulk purchase of the supply. Between these two points the supply undertaking has to fix its price, and it is not surprising in the circumstances that it should choose a figure near the statutory end of the scale. Nevertheless, there is too much of the safety-first attitude in the guess-work connected with fixing tariffs as the following examples show:—

Three companies, A, B, and C, whose areas of supply are closely associated geographically and are similar in density of population and type of consumer, purchase their supplies in the most part from the grid. Their charges to industrial consumers are such that a consumer making a maximum demand of 160 kVA and taking 240,000 kWh per annum would have to pay, meter rents and coal clauses excepted: Under A, £1,333; under B, £1,206; under C, £1,610. These discrepancies naturally appear to the power consumers as due to indefensible profiteering on the part of certain undertakings. When, however, we come to consider the charges to the domestic consumer, the absurdity of the situation becomes still more evident.

Favouring the Domestic Consumer

The domestic consumer who dwells in a house of five or six rooms and does his cooking, lighting and occasional heating by electricity is in a position nowadays to purchase energy at an "all-in" rate. That is, he will pay a fixed charge of, say, £5 per annum and a kWh rate of 0.75d. Under the assumed conditions, which are fairly common, a maximum demand of 4 kW cannot be considered unreasonable, while a consumption of 2,000 kWh per annum would be deemed satisfactory from the undertaking's point of view. The domestic consumer has then a load-factor of less than 6 per cent., yet in spite of this he is offered energy (referred to an industrial basis) at £1 10s. per kVA and 0.75d. per kWh, thus paying approximately the same average rate as an industrial consumer, whose load-factor is almost three times as good.

It would, however, be unfair to leave matters here, because the domestic consumer is the man who starts using electricity as soon as the factories are shut down for the night, that is to say, after six o'clock in the evening. At least, that is the supply undertaking's argument, with the addition that it is through the domestic consumer's good effect upon the station load curve that the industrialist will, eventually, be able to buy his energy at a very much reduced figure.

This hoped-for improvement is somewhat militated against by the fact that the man who works in the factory is also the domestic consumer, and, as such, expects a hot meal on his return from work. On this account cooking operations are commenced, in many instances, during the period over which the supply company's maximum demand takes place, namely, between four and six o'clock, and it might reasonably be expected that he should pay at the standard industrial rate. Since he does not do so, industrial charges must be unnecessarily high, or else a definite policy of "dumping" is in progress, for which the industrial consumer is being made to pay.

Slight differences in the price charged for energy by one supply undertaking and another are excusable on account of local conditions; but it appears to be indefensible for a supply company to charge A, who has a load-factor of 27 per cent., £1 more per kVA than it charges B, who has only a 16 per cent. load-factor, and, at the same time, to charge both A and B at the same rate per kWh.

There is little doubt that, owing to the dissatisfaction felt with present methods, the regulations governing the sale of electrical energy by companies in London will be extended to other parts of the country, for there is no question that the prevailing rates need overhauling. At the same time, it is quite clear that the industrial consumer is not making the best of existing conditions. In other words, he either will not, or cannot, understand how to improve his load-factor and thereby reduce the average cost of the energy supplied to him. Thousands of pounds are annually put into the pockets of the supply undertakings by the inefficient utilisation of electrical energy.

Examples of What is Possible

The following examples show the effect on costs of improving the load-factor under expert advice:—

Messrs. X are manufacturers of canned foods. The work of the factory is somewhat spasmodic owing to the impossibility of storing raw material for more than a few days at a time, and also owing to the seasonal fluctuation in raw-material supplies. Before taking expert advice the load-factor of the factory was 17 per cent. By a careful study of the lighting in its application to the work carried out by the employés it was found possible to reduce the demand for lighting by 15 kW, representing 20 per cent. of the previous total lighting load. A further improvement in load-factor was effected by introducing automatic control in connection with the water-pumping plant and increasing the existing storage system by 50 per cent. The ultimate result of these alterations was to increase the load-factor to 25 per cent. The total annual account was reduced by approximately 23 per cent.

Messrs. Y manufacture hardware. Both the raw material and the finished products are therefore storeable. The factory works three shifts a day, except during holidays. Before effecting the various suggestions put forward in connection with improving the efficiency of the factory the load-factor was 27.5 per cent. and the annual charge for energy amounted to over £500. Power-factor correction plant was installed, certain alterations were made in machine drives, and, in some cases, more efficient motors of a smaller h.p. were put in place of existing ones. The effect was to improve the load-factor to 34.4 per cent., and a new agreement was entered into with the supply undertaking which made a saving of about £80 per annum to the consumers.

The Reduction of Maximum Demand

The ideal way of improving load-factor, from the industrialist's point of view, is to reduce the m.d. If the desired improvement can be effected in this way, rather than by extending the uses to which electricity can be put in the factory, the consulting engineer will be looked on with favour. Under the usual two-part tariff agreement the manufacturer stands to gain on the score of reduced kVA charges as well as on a possibly lower kWh consumption; on the other hand, in many instances the load-factor can be improved only by increasing the use of energy, and as a rule under these circumstances the power user becomes conservative and will consider the matter only if he sees a chance of retrieving all the capital expenditure involved in a period of from three to five years. Unfortunately, when these conditions arise the consulting engineer often fails to get the support he deserves from the supply authority in a reduced kWh charge.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Fractional Horsepower Motors

THE ENGLISH ELECTRIC CO., LTD., Stafford, has added to its range of motors a number of fractional h.p. units of both the split-phase and capacitor-induction types. The latter (illus.), known as the "Capduction," is available in ⅛, ¼, ⅓ and ½ h.p. sizes at £4 14s., £5, £6 and £7 5s. respectively. It is designed for capacitor starting and capacitor running, the speed in all cases being 1,440 r.p.m.

The motors are of wrapped steel shell construction and the condenser is of the paper-insulated type embodying a special patented arrangement of connections. In designing the machines particular attention has been paid to silent running; another feature is the high starting torque which is maintained through the running-up period, thus affording sustained acceleration up to full-load speed.

The English Electric "Capduction" motor, type "LFK," with a saddle type condenser

The split-phase motors, which possess a good starting torque, have the stator core riveted up and solidly wrapped in a rolled-steel shell which provides a rigid seating for the end-brackets and consequently permanent bearing alignment. The stator windings comprise a high resistance winding which is in circuit only for starting, being cut out by a centrifugal switch when the normal winding comes into operation. The windings are insulated with mica, impregnated under vacuum and treated with damp-proof varnish.

These motors are suitable for applications where the starting torque required does not exceed 150 per cent. full-load torque, and are available in ⅛, ¼, ⅓ and ½ h.p. sizes at £3 7s., £3 9s., £4 6s., and £5 respectively.

A new combined table lamp ash-tray and match-box holder which is being marketed by the Stormlight Incandescent & Electrical Co., London

An Unusual Wall Plug

The "Exmet" wall plug has the usual fibre sleeve encased in a metal sleeve which makes the plug secure, indestructible and airtight. On insertion of the nail or screw the fibrous core is pushed partly along the metal sleeve, this action swelling out the innermost end of the plug and effectively keying it to the wall. Various sizes are available to take screws from ⅛ to 3½ in. long and a wall drill can also be obtained. During tests carried out by the manufacturers, JAMES STOTT & SON, LTD., 9, Sheil Road, Liverpool, 6, a No. 10 plug was inserted in a concrete arch and a 2 in. screw gauge 12 inserted into the plug. From this was suspended by a wire hawser and plank six adult persons weighing collectively 65 stone, placing a heavy strain upon the plug, which remained firm.

Bakelite Accessories

A neat bakelite lamp, particularly suitable for bedside use, has been introduced by CLANG, LTD., Crown Yard, Cricklewood, London, N.W.2. It is operated by an ordinary 4½-V flashlamp battery and can be obtained finished in green, mahogany, black or jazz, with a small celluloid shade over the lamp. There is also a moulded torch, available in walnut, mahogany or jazz, and made in two sizes, namely, 4¾ in. and 7¼ in. long.

The new "Clang" bakelite bedlamp and torch

An Electric Air-conditioning Machine

For the purpose of circulating cleaned, humidified and if desired, disinfected air into a room, STERILIZAIR, LTD., has introduced the "Sterizair" machine.

It is a self-contained unit, enclosed in a copper case and finished in oxy-silver, copper or chromium.

The contaminated air is drawn into the machine through a moist filter cloth at the side by means of a fan driven by a Verity electric motor, and is discharged into the room, cleaned and freshened. The water and disinfecting or perfuming agent is contained in the lower part of the apparatus. When the machine is in operation a special spiral continuously raises and discharges the water on to the filter cloth, thus keeping it moist. When the filter cloth becomes coated with impurities it can be removed for washing, or replaced by a spare clean cloth in a few minutes.

The "Sterizair" machine combined with a lighting fitting

Two sizes are available, the "Junior" model which has a capacity of 2,600 to 3,000 cu. ft. under normal conditions and has a loading of 40 W, and the larger model with a capacity of 4,000 to 5,000 cu. ft. and loaded at 60 W.

A Heat and Light Adaptor

The "Safeways" adaptor

The main feature of the new "Safeways" light and heat adaptor is the method of operation by two external 12 in. cords. The switch action is positive, and has a quick break, although the initial effort to operate the switch is only 11 oz.

The employment of small spiral springs to allow the cords to stand clear of the lamp prevents the recoil of the cords and beads after the release of the spring-loaded switch. It was found in an earlier type that the beads used often struck the lamp with sufficient force to break the filament, but with the present cord they remain practically stationary after use. The body of the adaptor is of bakelite, with phosphor bronze contacts and plunger spring. The price is 3s., and the makers are METAL COMPONENTS, LTD., Arundel Place, Eastern Road, Brighton.

There are also "Safeways" two-way adaptors fitted with single- and double-control.

Inductance Coils

A range of high-grade inductance coils—known as "Gecalloy" coils—are now made for practically all purposes which fall within the sphere of electrical communication, by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London. The coils are made with compressed magnetic dust cores, *i.e.*, finely divided particles of high magnetic metal which are coated with insulation material and moulded to form a solid mass. Construction of cores on this principle results in units that are mechanically strong and homogeneous, and at the same time possessing magnetic stability. This range includes choke coils, filter coils, loading coils, tuning coils, transformers, anti-interference coils, and single and tapped coils for oscillators, &c.

Two new bedlights being supplied by Specialities, Ltd., Liverpool

Metal-clad Outdoor Switchgear

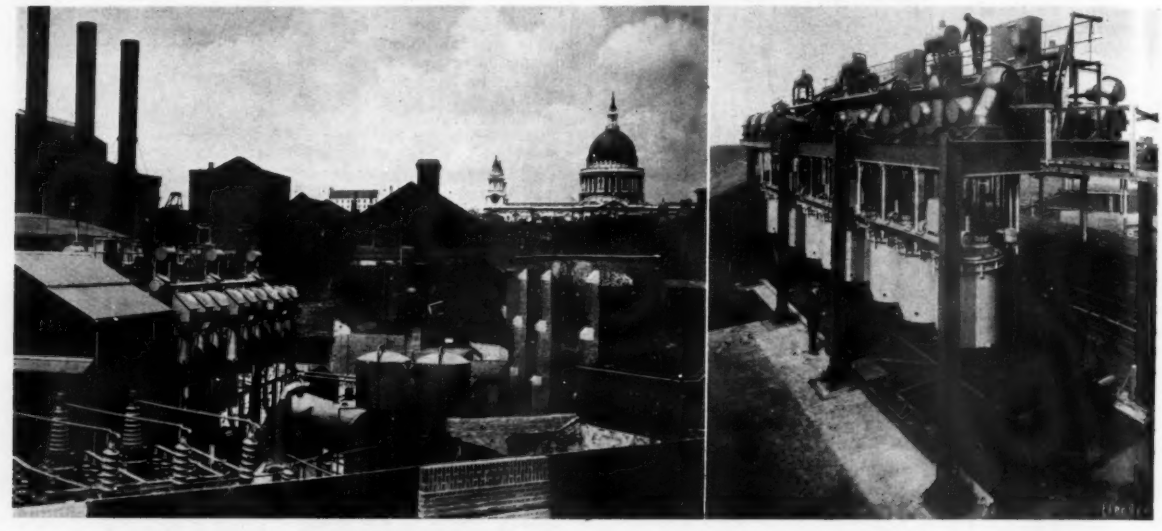
IN connection with the general linking-up of the South-Eastern section of the national grid there have recently been completed two installations of high-voltage switchgear for the Central Electricity Board's transforming substations at the Stepney Corporation's and the City of London Co.'s Bankside generating stations.

The salient feature of this 66,000-V equipment is that it is completely metal-clad, including all conductors and insulators, for use out of doors. Each of the installations is of 1,500,000-kVA breaking capacity, and the remarkably compact design is an important point in cities where sites are expensive.

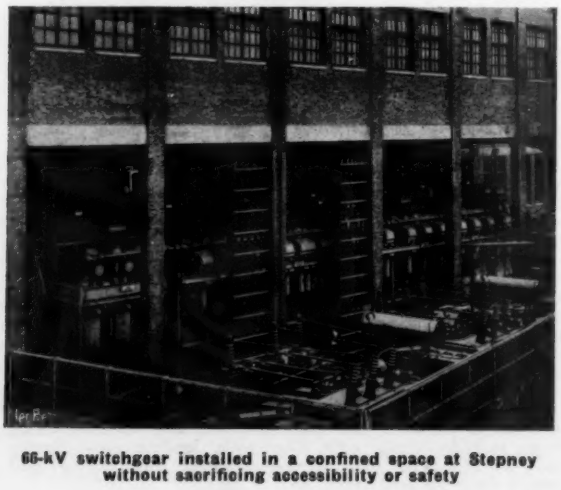
The switchgear, which is the first of its kind to be constructed, does not need costly buildings for shelter, and its earthed metal-clad enclosure has enabled it to be installed close to dwelling houses and oil-fuel tanks in the heart of London without risk. The switchgear illustrates the successful pioneer work of A. Reyrolle & Co., Ltd., in applying the metal-clad draw-out and drop-down principle at increasingly higher voltages, the maximum so far reached being the 132,000-V gear at the Tongland transformer station on the Scottish section of the grid.

The Stepney layout comprises one bus-bar coupler with two transformer and four feeder equipments. At Bankside there are two sets of bus-bars linked by two circuit-breakers and supplied by two feeders, with circuit-breakers to connect either transformer to either set of bus-bars. Since the circuit-breakers are not fixtures, a smaller number than usual suffices; they are interchangeable and each three-phase set can be lowered, transported, and plugged in another position.

This is the first instance in which complete metal-cladding has been employed in preference to enclosed switches with bare conductors and exposed insulators. By its use atmospheric deposits are rendered harmless, external painting can be done while the gear is in use, and general maintenance work can be performed without the elaborate precautions needed when open-type gear is used.



Left: Switchgear at Bankside in densely populated surroundings. Right: 66-kV gear at the makers' works



66-kV switchgear installed in a confined space at Stepney without sacrificing accessibility or safety

The two sets of bus-bars are enclosed at the top of the structure in copper tubes. Connections to the cable-sealing boxes are taken at intervals from the bus-bars through the circuit-breakers, which are contained in tanks slung from the framework in three-phase groups. Each phase is enclosed in its own metal casing and is entirely separate.

The isolating features embody a number of safety devices. When the circuit-breaker has to be inspected it cannot be lowered before it is switched off. An electrically operated truck is run underneath the breaker to be manipulated, its platform being raised by an electric motor until it takes the weight of the breaker. The platform of the truck is then lowered and the isolating contacts are disconnected. As the insulators are withdrawn from the orifices, metal doors swing round to close the mouths of the openings. When the breaker is raised again towards its operating position a projection on its carriage engages with a lever and opens the doors on the isolating contact orifices.

Insulating Methods

All the conductors in the fixed portion of the switchgear are provided with bakelised-paper insulators, and the chambers containing the conductors are filled with insulating oil. For long conductors and where there is likely to be a concentration of electrical stress, condenser-insulators are used. These contain a number of specially shaped pieces of metal-foil so arranged that the electrical stresses are distributed as nearly as possible uniformly throughout the insulation. The metal inserts enable the insulators to be made very small, also the material can be economically graded to withstand the stresses it will be subjected to, while the saving in insulating material is obvious.

Conservator tanks are mounted at the top of the switchgear to keep the oil under a small pressure in all the chambers, and these also provide for the expansion or contraction of the oil brought about by change of temperature. Owing to the constant head of oil, moisture is positively excluded.

Flexible bellows have been provided to permit some relative movement of the parts of the conductor casings. A comprehensive system of interlocking is incorporated, including the carriage used for isolating and moving the circuit-breakers. The carriage consists of a raising-and-lowering platform for moving circuit-breaker vertically, a traversing platform for moving the breaker sideways, and a main platform, on which the other platforms are mounted, for moving the breaker along the line of the switchgear. The main platform is operated from a controller which is so interlocked that the operating motors cannot be switched on unless the traversing platform is in the centre position and the hoisting-platform in its lowest position.

The traversing platform is so interlocked that it cannot be moved unless the main platform is correctly positioned and the hoisting platform is in its lowest position. A further interlock prevents the hoisting-platform being raised above the "isolated" position unless it is either totally empty or carrying a three-phase group of breakers.

Although it is normally intended that all the operations connected with the switchgear shall be carried out electrically, the various mechanisms have been designed also for manual working.

The Electrical Situation in France

THE latest report of the Department of Overseas Trade on the economic conditions in France, compiled by Sir Robert Cahill, C.M.G., Commercial Counsellor, H.M. Embassy, Paris (Stationery Office, 7s. net), like its predecessors, contains a great deal of electrical information.

The report, which is dated June, 1934, shows that trade generally between Great Britain and France since 1926 has declined continuously in value, except for a slight recovery in 1929. This movement was still further accentuated in 1931-33 as a result of the general trade depression, currency alterations, and restrictions imposed on the free exchange of commodities, such as the introduction or increase of duties and limitation of imports by quotas.

Electrical Manufacturing

An expansion from 25,000 to 100,000 workers, from 306 to over 2,500 million fr. of capital invested, and from 265 to over 4,000 million fr. in value of yearly output indicate the progress in the manufacture of electrical machinery, apparatus and fittings between 1913 and 1930. In 1930 there commenced a slackening of demand. In the heavy electrical machinery branch, orders in 1931 were 45 per cent. less than in 1930 (large machinery 55 per cent., turbines 38 per cent., transformers 37 per cent., large fittings 29 per cent.), and 55 per cent. less than in 1929; and in the first quarter of 1932 a further decline of 45 per cent. was recorded, relatively to the quarterly average of 1931.

In the case of small and medium-sized equipment the depression was less severe and did not make itself apparent until later; in 1931 there was a decline of 25 per cent. in output, while the first quarter of 1932 saw a further reduction of 28 per cent. in the case of machines and transformers, and of 15 per cent. in that of small fittings.

Both internal and external conditions have contributed towards the present position, the principal factors being imports from Germany as deliveries in kind, increasing taxation and wages and dumping by certain countries.

Imports and Exports

According to returns published by the French syndicate of electrical manufacturers, exports attained their highest point in 1930, with a tonnage of 35,007 and a value of nearly 521 million francs, declining slightly in 1931 and considerably in 1932. Taking 1927 as a basis there were increases ranging between 15.5 per cent. in 1929 and 27.4 per cent. in 1930, but in 1932 and 1933 exports fell to 30.3 and 23.6 per cent. respectively below the 1927 level. While there was a considerable expansion in the case of exports of wires and cables, there was a marked shrinkage in that of the heavier types of electrical machinery and (in 1929, 1931 and 1932) of miscellaneous items, though in 1933, in the case of the latter group, there was a recovery to practically the same level as in 1927.

Table I shows for the years 1927, 1930 and 1933 the weights and values of electrical goods exported :—

TABLE I.—FRENCH ELECTRICAL EXPORTS.

	Tons.			Thousand Fr.		
	1927.	1930.	1933.	1927.	1930.	1933.
Dynamos and transformers	7,254	6,126	3,014	86,898	83,159	39,046
Electrical and elec.ro-technical apparatus ...	6,042	7,166	2,684	141,046	185,039	80,553
Electric lamps	573	866	508	25,185	36,520	19,517
Insulated wires and cables	3,377	6,466	4,573	31,414	69,746	28,048
Electrical spare parts ...	1,193	2,583	909	23,297	50,384	16,003
Accumulators and parts thereof	1,905	3,352	2,040	20,919	36,505	15,906
Insulators (porcelain, glass, etc.)	3,123	4,584	3,308	14,527	24,661	14,058
Miscellaneous	4,007	3,864	3,957	31,655	34,791	43,013
TOTALS	27,474	35,007	20,993	374,941	520,895	256,144
Percentage increase or decrease compared with 1927	—	+27.4	−23.6	—	+38.9	−31.7

Imports of all kinds of electrical wares during the period 1927-1933 increased to a much larger degree than exports, this expansion being most pronounced in the case of dynamo-electric machines and electrotechnical apparatus. To a very considerable extent this was due to the heavy imports from Germany under the head of deliveries in kind. After Germany, the greatest increase was in imports from the United States.

Table II shows that imports were increased fourfold in weight in 1930 as compared with 1927, while the increase in value attained only slightly lower proportions. As a result of the limitations imposed by the quota regulations, 1933 saw reductions of 37.9 per cent. by weight and 43.4 per cent. by value, as compared with the high levels of 1930.

French householders, on the whole, appear, compared with American, Swiss and the people of some other countries, rather slow to adopt electricity in their homes for purposes other than lighting. Electric irons have been in fairly general use for some time past, but until comparatively recently electric radiators and vacuum cleaners were far from numerous, and other household apparatus such as cookers, refrigerators and water heaters were rarely seen.

A return published by the trade association of dealers in electrical heating and domestic electrical apparatus shows that

TABLE II.—FRENCH ELECTRICAL IMPORTS.

	Tons.			Thousand Fr.		
	1927.	1930.	1933.	1927.	1930.	1933.
Dynamo electric machines	2,366	11,417	3,820	52,847	205,463	63,493
Electrical and electro-technical apparatus ...	1,331	8,432	5,079	81,196	309,516	186,037
Electric lamps	293	907	517	39,179	110,936	71,074
Insulated wires and cables	1,923	3,924	5,440	22,557	43,178	42,346
Electrical spare parts ...	428	1,327	544	20,607	44,971	16,665
Accumulators and parts thereof	240	1,482	611	2,338	9,399	3,016
Insulators (porcelain, glass, etc.)	155	755	301	1,572	7,214	3,577
Miscellaneous	743	1,842	2,378	7,582	22,473	39,944
TOTALS	7,479	30,086	18,690	227,878	753,150	426,152
Percentage increase compared with 1927 ...	—	302	150	—	230	87

sales effected in France during 1930 by members of the organisation of domestic electrical appliances of French manufacture alone, attained 1,297,000 units, with a value of 84½ million fr. and represented a power consumption of 300 million kWh. Within the last three or four years both manufacturers and distributing companies have engaged in extensive propaganda with a view to familiarising the public with the advantages of domestic electrical apparatus.

The Radio Industry

In the last five years there has been a considerable expansion in the private use of radio; since 1929 the number of receiving

The machine hall of the St. Denis power station, Paris

sets in use has advanced from one in seventy to about one in twenty-eight of the population. The number of broadcasting stations, stated to be 300 in 1928, has been reduced to twenty-four, ten of which are private stations and fourteen State stations.

The value of the market in France for radio receiving sets and accessories has been estimated at about 400 to 500 million fr. yearly. Up to August last the number of licences applied for was just over 1,400,000, and it is estimated that there are at least another 200,000 sets not yet declared. French manufacturers are stated to be capable of meeting 75 per cent. of the demand.

No great changes have occurred since 1928 in the organisation of the industry and in the relative importance of the principal firms. The predominating concern, the Compagnie Générale de Télégraphie sans Fil, both a manufacturer and an operator of stations, increased its capital in September, 1929, by 31½ millions to a total of 100 million fr. It also holds controlling interests in half-a-dozen concerns with a total capital of 140 millions. Its international ramifications extend to holdings in Belgium, Italy, Spain, Czechoslovakia, Austria, South America, China, and other countries.

The imports of both valves and sets largely exceed exports, both in quantity and value. Holland formerly occupied a predominating position as a supplier of valves, furnishing 84.6 tons (80 per cent. of the total imports) in 1928, but her lead has been seriously challenged in the last three years by the United States, Germany, and the United Kingdom. The

position of the United Kingdom has receded from second in 1928-30 to fourth in 1931, third in 1932, and fourth in 1933 (43.6, 55.6 and 33.7 tons respectively), owing to the greater development of imports from the United States and Germany, and to the quota system. As regards sets, Germany and Holland alternate in the leading position, and together supply from 73 to 88 per cent. of the total imports.

The United Kingdom's share declined by 25 per cent. from 1928 to 1930, and although in 1931 and 1932 imports from the United Kingdom were 56 and 120 per cent. respectively greater than in 1930, her proportion of the total radio imports is only one-fourth of what it was in 1928. Exports of radio valves were not separately distinguished in the trade returns until 1929. In that year their weight was 87.3 tons and their value 7.8 million fr. After increasing to 96.6 and 112.8 tons in 1930 and 1931, they declined in 1932 to 80 tons, but recovered to 104.8 tons in 1933. The United Kingdom was until 1932 by far the largest customer taking 33, 42, 42 and 39 per cent. of the total exports in 1929-32, but in 1933 she took only 10.8 per cent. Exports of sets continued to expand until 1930, but in the next two years declined, and in 1932 were lower by half than in 1928. In 1933 exports advanced by 40 per cent. to 476 tons, mainly as a result of the large increase in purchases by the North African colonies.

The Electricity Supply Industry

The production and distribution of electricity in France provides employment for about 150,000 workers. The generating capacity of thermic and hydro-electric power stations combined represented about 9½ million kW at the beginning of 1933, with a yearly output exceeding 14 milliards of kWh. The combined productive capacity of thermic and hydro-electric power stations advanced, between January, 1926, and January, 1931, from 5,069,000 to 8,373,000 kW, of which 5,593,000 kW then represented thermic units and 2,780,000 kW hydro-electric. In the three years that have since elapsed, there has been an addition of about one million kW of installed capacity.

Four of the principal thermic stations (St. Ouen, Gennevilliers, St. Denis No. 1 and Issy-les-Moulineaux), each have a capacity of from 200,000 to 400,000 kW. Two others (Vitry-Sud and St. Denis No. 2) have begun to operate with installed capacities of 220,000 and 150,000 kW, and will be enlarged as occasion warrants, to an ultimate capacity of 500,000 and 400,000 kW respectively.

Three transmission lines at 220,000 V and ten lines at 150,000 V, are already either in service or near completion, while considerable progress has been made in the inter-connection of high-power transmission lines throughout the country. The total length of transmission lines belonging to distribution concerns alone was 194,685 miles at the beginning of 1931. The consumption of electricity per inhabitant was doubled between 1923 and 1930, increasing from 163 to 332 kWh.

Although the slackening of industrial activity has brought about a reduced consumption of electricity since the latter months of 1931, this decline has been compensated for to a considerable degree by the development in household consumption, due partly to the increasing electrification throughout the country and partly to a growth in the use for heating and other apparatus.

Railway Electrification

Of the seven main railway companies in France, only two, the Midi (or Southern) and the Paris-Orléans railways, have electrified any considerable proportion of their total mileage. At the end of 1932 the mileage of electrified main lines was 1,220, which with secondary lines made a total of 1,695 miles. The Superior Railways Council considered a report by the Superior Public Council on the electrification of certain railways, and recommended work on lines aggregating 1,500 miles and at the date of the report it remained for the individual companies concerned to enter upon more detailed investigation prior to deciding whether the work should be put in hand. The cost of the complete programme has been variously estimated at from three to six milliards of francs.

Telegraphs and Telephones

For some years there has been a decline in the volume of telegraphic traffic and it was more marked in 1931 than in 1930, the number of messages being lower by 4.39 per cent. This fall, apart from the competition of the telephone, is considered by the Post Office to be mainly due to the economic crisis and partly to the bad weather in the summer of 1931, which curtailed tourist traffic. In October, 1931, a second submarine cable from Marseilles to Bizerte in Tunisia was put into operation, and in August, 1932, a new cable from Marseilles to Oran in Algeria was completed. A second cable is being laid to connect France with Morocco, while in French West Africa, at the date of this report, a contract for a cable from Dakar to Konakry had been awarded to a British firm.

Steady progress is being made with the construction of long-distance underground telephone cables and the installation of the automatic system in Paris and other large towns. The programme for conversion of exchanges in Paris to automatic operation will be completed during the current year or next year, while by 1937 the change will be carried out in the immediate suburbs. The whole Paris system will then be equipped to serve automatically 373,000 subscribers with the possibility of expansion up to 433,000. The total number of telephone subscribers of all kinds was estimated at 1,185,000, and the number of telephones per 100 inhabitants at January 1st, 1932, was 2.90 in the whole of France.

The colonial and long-distance radio chain has been improved by the creation of a service in both directions with New Caledonia since December, 1928, Bangkok since February, 1931, and Shanghai since August, 1928. A new station for the exchange of radio-telephone messages was opened at Saigon in Indo-China in April, 1930. In addition to the important station at Bamako in French West Africa, a short wave inter-colonial station at Dakar has been completed. There are a number of stations in North Africa, Morocco and French Equatorial Africa.

The German Electrical Industry

A MARKED decline in the exports of the chief German electrical manufacturing concerns is revealed in a report on the economic conditions in Germany up to June last, prepared by the late Mr. J. W. F. Thelwall, C.M.G., M.C., Commercial Counsellor to H.M. Embassy, Berlin, and issued by the Department of Overseas Trade (Stationery Office, 3s. 6d. net).

Exports of electrical machines fell from 27,302 metric tons in 1932 to 13,133 in 1933, the respective values being RM. 72 millions and 35 millions. Foreign sales of other electrical products decreased from 64,245 metric tons (RM. 251 millions) to 54,055 (RM. 185 millions). Electrical products exported to Great Britain were 2,217 metric tons in 1933 (RM. 8,848,000) compared with 2,939 (RM. 11,287,000) in 1932.

The year was noteworthy for the intensive propaganda campaign carried out in Germany itself, as a result of which it was reported that 2,500 additional men had been given employment in Berlin alone. A new Federation of the German Electrical Engineering Industry was established in November, 1933, to include all manufacturers. The Minister for Economic Affairs advocated the formation of "Electrical Front" organisations to improve the supply of electricity and apparatus and equipment of all descriptions.

Improved Radio Business

With regard to radio the revival in the home market was claimed to have more than compensated for losses in foreign sales, amounting to 34 per cent. in volume and 31 per cent. in value in 1933, compared with 1932. The heaviest drop in exports was experienced in sales to Switzerland, France, Belgium, the Netherlands and Czechoslovakia, while markets which became more active included Italy, China, Turkey, the Dutch East Indies, Portugal, Egypt, Brazil and British India.

The number of receiving sets sold by German manufacturers from August, 1932, to July, 1933—approximately 1,000,000—was 8 per cent. higher than in the preceding twelve months, but the total value was lower. Production and sales in the second half of 1933 continued on a higher level than in 1932, and at the end of the year employment in the industry was stated to be 22 per cent. higher than in 1932. The greater activity was attributed mainly to the energetic manner in which the industry had been fostered by the Ministry of Propaganda.

A network of 2,000 advisory offices was organised to encourage sales and to assist in eliminating the difficulties of listeners. The number of registered broadcast listeners was 5,424,755 at April 1st.

Exports of electric lamps, which declined from 60.4 millions in 1931 to 40.8 millions in 1932, rose to 43.2 millions in 1933. Of this quantity 36.9 millions were disposed of in Europe, 3.4 millions in America, 2.3 millions in Asia and 428,000 in Africa. The Minister for Economic Affairs in November, 1933, issued an order prohibiting the opening of new works for the manufacture of electric lamps under 30 V, or the extension of existing production. At the end of September import duties were raised as a protection against Japanese competition.

(Continued at foot of opposite page)

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

The F.B.I. Business Forecast

The "Business Forecast" published in the Federation of British Industries' "Business Barometer" states that there has been no change of importance since the last forecast was issued. It is, however, becoming increasingly clear that so far from British trade being, as many still believe, at the beginning of a recovery, it is probably already back to normal, having regard to the limitations of the international situation. That situation shows few signs of improvement, and in some directions has deteriorated. Apart from many outbreaks of social and political unrest, and the exacerbation of trade and exchange restrictions, the condition of certain of the countries still on an operative gold standard is giving cause for anxiety. In the United States while many still look for an autumn revival, there are no fresh grounds, apart from an increase in State-promoted schemes of work, for anticipating any marked speeding-up in the placing of orders.

An E.D.A. Poster Design Competition

The results of the Poster Design Competition organised by E.D.A. have now been announced. This competition for ideas, or designs, for posters was confined to persons engaged in the electrical industry, and nearly 300 ideas or designs were submitted. The Council has awarded prizes as follows: First and second prizes combined: Eight guineas each to Messrs. W. Jervis (North Metropolitan Electric Power Supply Co., Tottenham), and I. H. Gumbrell (London & Home Counties J.E.A., Dorking). Third prize: Four guineas to Mr. F. J. Brandt (Electricity Supply Board, Dublin).

Markets for Traffic Signalling Apparatus

The Department of Overseas Trade has issued confidential reports on the markets for road traffic signalling apparatus in Norway and Spain.

A Halifax Electrical Exhibition

We have received from the organiser and manager, Mr. M. F. Farrar, M.A., preliminary particulars of an electrical exhibition which is to be held at the Marlborough Hall, Halifax, from September 19th to 29th. The opening ceremony will be performed by Sir Felix Pole (chairman, Associated Electrical Industries, Ltd.). The chairman of the exhibition is Ald. T. Hey, J.P., chairman of the Halifax Corporation Electricity Committee, and it is stated that the show has the support and co-operation of that Committee and of the leading manufacturers and wholesalers and local contractors. One of the features of the display will be an all-electric home and a number of special side shows have been arranged. We are informed that at the last exhibition of the kind held at the Marlborough Hall a year ago the attendance was nearly 20,000. Full particulars are obtainable from Messrs. M. F. Farrar and Co., 10-14a, Crossley Street, Halifax.

A New London Electric Sign

Canada's new neon sign on the Trafalgar Advertising Co.'s site in Trafalgar Square was illuminated on August 1st. Mr. R. B. Bennett, Prime Minister of Canada, delivered a short speech by radio-telephone from Ottawa, which was received at Canada House, where an informal reception was held in the High Commissioner's Office. After his speech Mr. Bennett pressed a button on his desk in Ottawa which operated a switch in the Trafalgar Advertising Co.'s switchroom, thus starting the sign. This shows a mammoth maple leaf, followed by a red triangle which in turn is succeeded by the word "Canada" in large letters, and then the words "Quality Mark" at the base of the triangle. Finally, the slogans "Canada the Empire's Larder" and "Ask your Grocer" appear. The scintillating sign, which is part of the scheme, flashed Mr. Bennett's speech a few minutes after he had spoken. The sign was manufactured by the Trafalgar Advertising Co., Ltd., and its dimensions are 20 ft. by 50 ft. The word "Canada" is in 6-ft. letters, the "Maple Leaf" is 18 ft. high, and the triangle 20 ft. There are over 800 ft. of 15-mm. and 20-mm. neon tubing in red, blue and green. The

Canada's new electric sign in Trafalgar Square

radio-telephone arrangement for the switching on of the sign from Ottawa was set up on a four-wire basis to provide for conversation. The transmission was by beam radio in both directions.

Marking of Mining Lamps Imported into France

A new regulation has lately been issued in France relative to foreign electrical accumulator safety lamps for use in mines, portable battery lamps and cases for such lamps brought in separately, and charging benches for miners' electric safety lamps imported into France to the effect that they must be clearly stamped with the name of the country of origin in indelible characters. Upon the lamps and cases the name must be engraved in letters at least 3 mm. in depth, while battery charging sets must have the name of the country of origin in at least 5 mm. letters near the name of the maker.

Recent Contracts

The Westinghouse Brake and Saxby Signal Co., Ltd., has received a contract for the supply of signalling apparatus for Bandra (Bombay, Baroda and Central India Railway). The apparatus will include colour light signals, point machines, relays, and a 107-lever power interlocking frame.

For the new graving dock at Jarrow, which has been constructed by Messrs. Swan, Hunter & Wigham Richardson, Ltd., the pumping machinery was supplied by Messrs. Drysdale & Co., and consists of two electrically driven centrifugal pumps of a total capacity of 70,000 gallons per minute, capable of emptying the dock in two hours.

A *Reuter* message from Helsingfors states that the Finnish Government has authorised Finland's Broadcasting Company to sign a contract with Marconi's Wireless Telegraph Co., Ltd., for the delivery of new station plant with a minimum capacity of 150 kW.

The Marconi Co. has also received a contract from the Brazilian Government for the construction and installation of nine wireless transmitting and receiving stations to provide a network of new telephone and telegraph services throughout Brazil. Three stations will be erected at Rio de Janeiro, two at Recife and one each at Porto Alegre, Belem,

The German Electrical Industry (*continued from opposite page*)

The annual report of the Siemens concern for the year ended September, 1933, showed a net profit of RM. 9.03 millions for Siemens and Halske, and neither gain nor loss for the Siemens-Schuckertwerke. For both companies the number of employés rose from 75,000 in 1932 to 79,000 in 1933, 53,000 and 61,000 respectively being in Germany. The wage bill declined from RM. 132 to 113 millions. Foreign trade was stated to be particularly unsatisfactory compared with the period before the crisis.

It was anticipated that the balance sheet of the A.E.G. would show further losses and that the deficiency of RM. 31 millions would be increased by about 60 or 70 per cent. Among foreign orders notified early in 1934 was the equipment of three sugar factories in Ireland. With regard to C. Lorenz A.G., Berlin, a profit of over RM. 1 million was attributed to Government measures. Orders in hand at the beginning of 1934 were higher than a year earlier, and the number of employés had increased from 1,800 in January, 1933, to 3,300 in April, 1934.

Power Production and Railway Electrification

The production of electricity by 122 large power stations, representing about 50 per cent. of the country's total capacity, amounted to 14,200 million kWh, as against 13,600 million in 1932. Sales to industrial undertakings rose by 25 per cent. Energetic propaganda by the Berlin Electricity Works was reported to have resulted in 20,000 additional dwellings being equipped with electric light in 1933, and another 10,000 installations were being carried out early this year. Tariffs for cooking were reduced by between 26 and 38 per cent. below ordinary rates.

The electric railway lines were extended from 1,638 km. to 1,901 km. in 1933 by the opening of new services between Augsburg and Stuttgart and Berlin and Wannsee.

Bahia, and Fortaleza. The contract includes three 2-kW transmitters for both telegraph and telephone working, one 2-kW transmitter for telegraph only, four 1-kW transmitters for telegraph and telephone working, one 1-kW transmitter for telegraph only, and nine receiving installations. Directional aerials will be used for both transmitting and receiving.

For Sale

Dover Corporation invites offers for the purchase of a 1,500-kW turbo-generator and a 30,000-lb. water-tube boiler.

Cardiff Electricity Department has a.c. motors for sale.

(See our classified advertisements.)

Trade Announcements

Messrs. Davis & Timmins, Ltd., have closed their premises in York Road, King's Cross, N., and all departments are now concentrated at the Wood Green establishment. The address of the registered office, head office and Transfer Department is now Brook Road, Wood Green, N.22.

Messrs. C. A. Newton & Co., electrical engineers, have opened new showroom premises in St. James's Street, Derby.

The German Cable Industry

As a result of the revival in the German inland market the degree of activity both in the h.p. and the l.p. cable industry is reported to have improved by about 60 per cent. in the past twelve months, especially in connection with the Government measures for the provision of work and the orders allocated by the Reich postal authorities. The number of works is between forty and fifty and they are divided into three syndicates for h.p. cables, l.p. cables, and insulated conductors respectively. The headquarters are situated in Berlin and members are allotted production quotas in the business, but financial penalties for exceeding these quotas are only imposed to a small extent. There still exist a few works independent of the insulated conductor syndicate, while in the case of the cable industry a Government veto on extensions of works or the establishment of new works was imposed some time ago. Concerning the export trade it is stated that there was an improvement in the first five months of the present year, when the exports amounted to 7,940 tons as compared with 6,210 tons in the corresponding period of last year. These figures, however, are far behind the exports of 18,390 tons in the first five months of 1931.

The German Radio Industry

New agreements have just been entered into in Germany between the makers of wireless sets and accessories and the merchants and dealers. The number of the latter two classes has been reduced in the past year from 1,500 to 750 and from 60,000 to 37,000 respectively. According to an official report issued by the Reich Union of the Wireless Industry, a state of over-production has prevailed and no fewer than 370,000 wireless sets, including 100,000 so-called "national receivers," were unsold at the end of the season as compared with a normal number of about 90,000 to 100,000. Hopes are entertained of disposing of this number during the season now beginning, at price reductions of 10 to 30 per cent.

The Timber Market

The demand for the ordinary housebuilding timbers imported from Europe and Canada has been very good over the past month, and is helping to keep pace with the large supplies that have come on to this market. The high-class joinery woods are in fair stock, with prices very firm. Although there are large quantities of the popular hardwoods for furniture, cabinet and decorative work in store, oak supplies from the United States have been lighter of recent weeks, mainly owing to the high values under N.R.A. regulations, which have stayed purchases by United Kingdom buyers. Mahogany is going well into consumption, but generally the fancy woods are of light stock and demand. There is plenty of plywood in the country, the demand for which has been good.

Electrical cricketers at Birmingham

Prices of Materials

Messrs. F. Smith & Co. report, August 8th: Copper (electrolytic) bars, £32 10s., 10s. dec. Ditto, ditto, wire rods, £36 10s., £5 dec. Ditto, ditto, h.c. wire 6½d., ⅛d. dec. Silicium bronze wire, no change.

Messrs. James & Shakespeare report, August 8th: No change in the price of copper bars (best selected), sheet and rod, and English pig lead. Electrolytic copper bars, £32 5s. to £32 15s., 10s. increase.

Messrs. Edward Till & Co. report, August 8th: No change in the price of india-rubber, Para fine.

Rubber Reclamation

An arrangement has been made whereby the Rubber Regenerating Co., Ltd., of Trafford Park, Manchester, is to pass entirely into British ownership. For many years this company has been one of the largest manufacturers of reclaimed rubber in this country and has also acted as European agent for the Naugatuck Chemical Co., U.S.A., for chemicals used in the rubber industry. The company is to continue its business under the same executive management and will also continue its chemical business with the Naugatuck Co. It has acquired the "Solvent" reclaim patents and business of the Thames Hard Rubber Corporation, Ltd., and Kaycee, Ltd., in Great Britain.

Ferranti employés on holiday

Social Events

The illustration reproduced above shows some of the employés of Messrs. Ferranti, Ltd., leaving Hollinwood for their recent annual outing. Six trains were necessary, all of which, with the exception of one, went to Blackpool. Out of the total number of approximately 6,250, about 2,600 went on the trip, and of these about 300 went to Glasgow, a trip to the Kyles of Bute being also included.

What proved to be an extremely popular evening was arranged in Birmingham on July 24th by the staff of the Frequency Change Department of the Birmingham Electric Supply Department and representatives of the various electrical manufacturing firms. A cricket match was followed by a smoking concert held at the Red Lion Hotel. The manufacturers, who batted first, won the cricket match, with a score of 152 runs for 5 wickets, Mr. Willman of Lancashire Dynamo & Crypto, Ltd., scoring 67 runs. The score made by the Frequency Change Department was 118 for 10 wickets. The umpires were Mr. Hooper of the Central Electricity Board and Mr. Pinckton of Laurence, Scott & Electromotors, Ltd. After supper at the Hotel, the company was entertained by Mr. H. Strange, Electric Supply Department, Mr. Sargeant, British Thomson-Houston Co., Ltd., Mr. R. H. Rawll, frequency change engineer, and Mr. W. Strange, Electric Supply Department.

Electricity Supply Workers' Wages

The Industrial Court by an award dated August 2nd has granted an advance of a fraction of a penny per hour to the engine room and boiler-house staffs of the electricity supply industry in the North-Western area. The claim put forward by the men was for an advance of 2d. per hour. Jointer's mates employed in the same industry are also to receive a fraction of a penny increase.

Holidays

The works of Aklum Storage Batteries, Ltd., will be closed from to-morrow (Saturday) until August 18th inclusive.

The Norwegian Market for Batteries

The Department of Overseas Trade has issued a confidential report on the market for batteries in Norway, furnished by

the Commercial Secretary to H.M. Legation at Oslo. This states that the market for primary batteries seems to be confined almost exclusively to dry cells. The dry battery principally in demand for telegraph and telephone circuits, as well as for bell circuits, is the large 1½-V round cell. Of these the State Railways use between 3,000 and 3,500 annually and the Telegraph and Telephone Board about 60,000 annually. The use of dry cells for telephones is, however, gradually diminishing owing to the extension of the automatic telephone system. So far as can be ascertained none of these batteries has ever been imported from the United Kingdom. Flashlamp batteries are in comparatively large demand, but competition is very keen and prices are cut to a minimum. The demand for h.t. batteries for radio sets is very much smaller than it was some years ago, owing to the transition to mains-operated receivers. Norway receives most of the business, but it has to face competition from Germany and the United Kingdom. In the case of motor-car starting and lighting batteries, competition is extremely keen, and while there are a variety of United Kingdom batteries on the market, it is considered that the trade is a poor one, the Norwegians taking most of the business. United Kingdom manufacturers have a fair share of the trade in l.t. radio accumulators, but the market is insignificant. Summarising the position, the report states that the prospects of increasing trade from the United Kingdom are not very bright, and it would be no easy matter to find a good agent to introduce a battery (whether primary or secondary) which was new to the market, in face of the existing competition from Hellesens and Norwegian factories.

Polish Lamp Prices

At the instance of the Ministry for Trade and Industry, the makers of incandescent lamps in Poland have reduced the prices of lamps up to 25 W by 24 per cent. and other lamps by an average of 16 per cent.

The West Indies Battery Market

A report on the market for electric batteries in Trinidad, British Guiana and Bermuda, prepared by H.M. Trade Commissioner in the British West Indies, has been issued by the Department of Overseas Trade. This states that, except in the case of Trinidad, where batteries are being made in Port of Spain from imported materials, all batteries are imported. Dry cells are imported in considerable quantities, but wet and inert cells have very little sale in this market. Primary batteries are imported from the United States, Canada and the United Kingdom, and generally speaking the North American product appears to be preferred. As radio reception in many of the West Indian colonies is not such as to stimulate any marked interest in radio receiving sets, the demand for secondary batteries for radio purposes is not considerable and a better field is afforded by the needs of the motorist. Bermuda, however, is an exception, as motor cars are still forbidden, and the market is therefore poor. Motor car batteries of United Kingdom production compare favourably with other batteries on sale. The battery business will probably continue to be shared by the United States, the United Kingdom and Canada, and of the three types of batteries most in use, namely, for telephones, for motor cars, and for torchlights, the demand for the first-mentioned is the most likely to show decline.

The Marking of Imported Accessories

On November 10th, 1933, the Board of Trade issued a Merchandise Marks Order in respect of certain electrical accessories (named below), the Order to take effect on February 10th, 1934. In February last an Exemption Order was passed to deal with unsold stock which had been imported prior to November 10th, 1933. Under this Order it was permissible to affix to the articles labels indicating the country of origin. This exempting order has now expired; hence, on and after August 10th it will not be lawful to sell or expose for sale in the United Kingdom any imported electrical accessories of the following descriptions:—Lampholders; ceiling roses; adaptors for lampholders; switch plates; articles up to and including 30-A rating of the following descriptions:—Switches; cut-outs; fuses; wall sockets; pluga for wall sockets; plug adaptors for wall sockets; plugs for use as connectors to portable or mobile appliances; and sockets for use as connectors to portable or mobile appliances unless they bear an indication of origin.

The indication of origin must be applied as follows:—(a) Die-stamped, impressed, embossed, engraved or moulded on each article, provided that in the case of cartridge fuses less than ¼ in. in diameter and 2 in. in length and switchplates of glass it shall be a sufficient compliance with this requirement if the indication of origin is stamped or printed on a label securely affixed to each article; and (b) stamped or printed on any carton or other container in which the goods are sold or exposed for sale.

Trolley Buses for Durban

The Durban Corporation is shortly to inaugurate a trolley bus service and eleven Sunbeam-B.T.-H. four-wheel buses, forming part of Durban's first fleet, are now being shipped. These buses are the Sunbeam Co.'s "M.F.2" four-wheel type with B.T.H. regulated field electric traction equipment and "Slough" rheostatic resistances. In this type the motor and transmission are off-set from the centre line of the chassis, giving a clear central floor space for the lower saloon and a low loading height. Braking is effected by means of the Sunbeam-Lockheed hydraulic system, incorporating a patented compensating and sealing device. The electrical equipment is specially wound to suit the climatic conditions and all aluminium parts are treated with a special preservative as protection from the humidity of the atmosphere. An M.C.L. dynamo 12-V lighting equipment is used for the "legal" lights and for operating the electrical accessories. The bodies have been built by Park Royal Coachworks, Ltd., and are of the double-deck type with seating accommodation for twenty-four passengers in the lower saloon and thirty-one in the upper saloon. The bodies are of composite construction and embody numerous special features, ventilation being an important feature. Among the interesting special instruments on these vehicles are Miller mileometers

One of the Sunbeam-B.T.H. trolley buses ready for despatch to Durban

mounted on the front (nearside) hubs; Brecknell-Willis deviation indicators, which are mounted on the trolley pole base and indicate in the driver's cab when the trolley poles are approaching the maximum distance laterally permissible from the overhead wires; and "Leakalarm" indicators manufactured by the Universal Rubber Co., Ltd.

New Catalogues and Lists

British Insulated Cables, Ltd., Prescot.—A leaflet on welding copper.

Gent & Co., Ltd., Faraday Works, Leicester.—A catalogue of "Pul-syn-etic" electric impulse clocks for ships; and booklets on liquid level indicators and alarms and electric turret and bracket clocks on the "Pul-syn-etic" system.

Geo. Bray & Co., Ltd., Leeds, 2.—A leaflet, on radiators, of a suitable size for enclosure in letters.

Renold & Coventry Chain Co., Ltd., Renold Works, Didsbury, Manchester.—Price lists of products for industrial applications and a stock drive booklet.

Lancashire Dynamo & Crypto, Ltd., Willesden, N.W.10.—A leaflet on synchronous induction motors.

Arthur Preen & Co., Ltd., 43, Mortimer Street, W.1.—A catalogue of portable electric radiators.

Rhodes, Brydon & Youatt, Ltd., Waterloo Engineering Works, Gorsey Mount Street, Stockport.—A leaflet on self-priming pumps.

W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.—A leaflet dealing with industrial soldering irons entitled "Professional Heavyweights."

Century Lamps (London), Ltd., 89, Upper Thames Street, London, E.C.4.—A leaflet on "Daystar" lamps.

British Electric Domestic Appliances, Ltd., 3, Hanover Court, Moor Lane, London, E.C.2.—A blotter for August, advertising the "Mary Ann" cleaner.

M. & C. Switchgear, Ltd., Kelvinside Works, Kirkintilloch, Glasgow.—A leaflet on disconnecting link boxes.

Crofts (Engineers), Ltd., Thornbury, Bradford.—A catalogue of "Sure-Grip" drives.

Walker Fender Co., Ltd., Despatch Works, Sherborne Street, Ladywood, Birmingham.—A leaflet illustrating new electric table standards.

Bankruptcy Proceedings

L. D. McDowall, trading as "Leslie's," 17, Upper Stone Street, Maidstone, radio dealer.—This debtor's public examination was held at the Sessions House, Maidstone, recently. The statement of affairs showed ranking liabilities of £821 and assets of £84, leaving a deficiency of £737. In March, 1932, debtor commenced business at King Street, Maidstone, as a radio dealer, without capital. In January, 1933, with a view to reducing his expenses he removed the business to 17, Upper Stone Street. The business, however, was not successful, and in December last year the creditors decided to allow debtor a twelve months' moratorium, on condition that he accounted weekly to a firm of accountants. Debtor had paid only £2 over to them. He said that he supplied customers with sets on hire-purchase terms, and when default occurred, he was responsible to the wholesalers. He had to take back the sets in nearly every case, and resold them at a depreciated value. To the end of 1932 the turnover did not exceed £15 a week, which yielded little profit. The failure was attributed to heavy overhead expenses, bad debts on wireless sets sold on hire purchase, want of capital and bad trade. The examination was formally closed.

J. R. Durber, trading as Durber Bros., Red Lion Square, Newcastle-under-Lyme, and City Electrical Supplies, 183, Lon-

don Road, Stoke-upon-Trent, electrical engineer.—This debtor's public examination was held at Hanley, Stoke-on-Trent, on August 2nd. The statement of affairs showed ranking liabilities of £631, and assets of £36, leaving a deficiency of £595. Debtor said that he commenced business as an electrical contractor in September, 1932, in partnership with his brother. Later the partnership was dissolved, and since early in 1933 debtor had carried on the business alone. He undertook contracts for the local Corporation, for which work he obtained materials on credit. Between February 9th and March 14th this year, debtor had authorised the Corporation to pay £375 due to him under contracts, to his creditors. He attributed his failure to lack of commencing capital and bad debts. The examination was closed, subject to debtor producing a statement from his bank.

C. H. Burt, director, Norfolk Road, Regent's Park, N.W.—The statutory first meeting of creditors was held on August 2nd at London Bridge Buildings, when accounts were submitted showing liabilities of £1,271 and assets valued at sufficient to yield a surplus of £11,081 after payment of all debts. According to the debtor's statements he was appointed in 1893 as manager of a London firm of electrical engineers, and in August, 1896, he started on his own account by purchasing a one-half partnership in the business of M. Burt & Co., 75, High Holborn, and 123, Oxford Street, W., electrical engineers and electric light fittings manufacturers. In 1899 he became sole owner of the business, which was transferred to 195, Wardour Street, W., in 1902. The business was subsequently amalgamated with another concern and carried on as Burt, Escaré & Denelle, Ltd. The debtor attributes his present position to inability through lack of funds to settle certain liabilities of a company, which had been disclaimed by the receiver for the debenture holders. The meeting was adjourned for one week.

C. Uren, trading as the Eclipse Wireless Co., 120, Stapleton Road, Bristol, wireless dealer.—The first meeting of creditors was held at the Official Receiver's offices, 26, Baldwin Street, Bristol, on August 2nd. The statement of affairs disclosed ranking liabilities of £817, and assets of £15, leaving a deficiency of £802. Debtor said that he commenced trading as above in 1928. He was not successful and during the last twelve months creditors had been pressing. He attributed his failure to want of capital, keen competition and pressure by creditors. The matter was left in the hands of the Official Receiver, as trustee.

J. Drake, electrical and wireless contractor, 93, St. Leonards Road, Windsor.—Receiving order made July 26th on debtor's own petition.

H. Mortimer (Mortland Radio & Electric Co.), radio dealer, 4, Green Road, Meanwood, Leeds.—Trustee, Mr. C. H. Baker, 3, Alfred Street, Boar Lane, Leeds, appointed July 28th.

A. Roberts (Castle Radio Manufacturing Co.), formerly of 161, Westminster Bridge Road, S.E.—Trustee, Mr. F. T. Smith, 150, Southampton Row, W.C., released June 18th.

A. S. F. Carpenter, radio dealer, Stourvale Radio Stores, Christchurch.—First and final dividend of 3s. 11d. in the £, payable August 14th, at 10, Rockstone Place, Southampton.

Company Liquidations

Cam Electrical Co., Ltd., Kilburn Lane, N.W., and Warple Way, Acton.—The accounts lodged under the compulsory liquidation of this company show total liabilities of £17,345 (ranking £16,226); assets of £1,100 (absorbed in preferential and debenture claims); and a deficiency of £18,226 with regard to contributories. The issued capital consists of 2,000 ordinary shares of £1 each. The Official Receiver, who also acts as liquidator, reports that the company was formed in August, 1931, to carry on business as manufacturers, repairers and retailers of all classes of goods in connection with wireless telegraphy, telephony and television. The directors attribute the failure to the excessive price paid for the assets taken over from another company and to the general slump in trade.

Vera Cruz Telephone Construction Syndicate, Ltd.—Meeting, August 31st, at Spencer House, South Place, E.C., to receive an account of the winding-up by the liquidator, Mr. C. C. Baker.

W. D. Williams & Son, Ltd.—Winding up voluntarily. Liquidator, Mr. W. Ll. Llewellyn, 522, Royal Liver Building, Liverpool.

Private Arrangements

F. Dawson, trading as F. Dawson & Co., York Place, Leeds, wholesale electrical dealer.—At a meeting of creditors on August 2nd at Leeds, the representative of the Magna Wire & Cable Co., Ltd., the largest trade creditors, was elected to the chair. The statement of affairs showed ranking liabilities of £1,450, which included £467 due to cash creditors, and net assets of £890, leaving a deficiency of £560. It was stated that the debtor commenced trading at York Place, Leeds, in August, 1933, and at Spring Bank, Hull. The commencing capital was £120, which was advanced by his wife, who had since lent further sums totalling £442. The debtor had held the agency for a well-known firm in the trade. Some time ago, however, the firm dispensed with agents and that had affected the turnover of the business. Approximate figures which had been prepared showed that the turnover at both shops had been about £4,300, and a loss of £100 had been incurred. The deficiency was due to loss on the trading together with the drawings of £182, and the writing-down of the assets in the statement of affairs. A resolution was passed confirming a deed of assignment already executed to Mr. C. Turner, 155, Norfolk Street, Sheffield, whilst a committee was also appointed.

W. H. B. Smith, 49, High Street, Haverhill, Suffolk, wireless dealer, &c.—At a recent meeting of creditors a statement of affairs as at July 17th last was submitted which showed liabilities of £785 and assets estimated to realise £831, leaving a surplus of £46. It was stated that the debtor had been in business for about eighteen months, and commenced with a cash capital of about £100. He employed a manager, whilst he, himself, continued his own employment at Bury St. Edmunds. The creditors decided that the debtor should execute a deed of assignment in favour of Mr. E. G. D. Elworthy, 7, Downing Street, Cambridge, as trustee. A committee of inspection consisting of three of the principal creditors was also appointed.

Electricity Supply

Lighting, Domestic, Power

Aldershot.—CHANGE-OVER.—The Town Council is to proceed with the change-over of a portion of the electricity system at an estimated cost of £4,016.

EXTENSIONS.—Mains extensions are to be carried out in Bellevue Road, Clockhouse Estate, and Avondale and Southmead Roads, and application has been made to the Commissioners for sanction to defray the cost out of the reserve fund account.

Barrow-in-Furness.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at an estimated cost of £1,100.

Bedford.—TARIFF REDUCTIONS.—The Corporation announces revisions in charges for electricity consumed under the two-part tariff to take effect from the September meter readings. The revisions particularly affect consumers occupying shops, farms and dwelling houses outside the borough.

Bideford.—DECORATIVE LIGHTING.—The Town Council has agreed to spend £250 on cables and coloured electric lamps for illuminating the river banks, quay and Long Bridge during regatta week and other suitable occasions.

Blackpool.—SUB-STATIONS.—The Electricity Committee is to erect a sub-station at the rear of Devonshire Road, adjacent to Red Bank Road, and at Stanley Road, South Shore.

Boston.—EXTENSIONS.—The Boston & District Electric Supply Co., Ltd., is shortly to erect a h.p. line from Boston to Wrangle to supply Fishtoft, Freiston, Butterwick, Benington, Leverton, Old Leake and Wrangle.

Bristol.—ELECTRICITY FOR HEATING.—The Housing Committee recently discussed the question of the extended use of electricity and it was recommended that houses should be wired for heating as well as lighting, and that an electric wash-boiler, which would also supply hot water to the bath, should be provided. The cost of current is ½d. per kWh, and tenants would have to provide their own irons and fires. It was decided to experiment with between 40 and 50 houses.

LOAN.—The City Council has decided to apply for sanction to borrow £375,664 for the extension to the Portishead generating station.

Bury (Lancs).—REDUCED METER RENTALS.—The Town Council has reduced meter rentals to 1s. per quarter up to 25 A, 2s. per quarter 26 to 50 A, and 3s. per quarter over 50 A.

Canada.—NIAGARA FALLS.—According to a *Reuter* message from Toronto, Ont., plans are being considered for harnessing the water power of the Niagara Falls to its full extent, thereby increasing the present output of the system by 500,000 h.p. It is hoped to do this by erecting new plant or by the gradual increase of existing generating facilities. The scheme is being considered by the Ontario Hydro-Electric Commission, the annual report of which shows that the demand for power at the end of 1933 was approximately 40 per cent. greater than at the end of 1932. In December, 1933, the demand for power was 1,440,046 h.p., as compared with 1,037,957 h.p. in the preceding December.

The report adds that the total investment of the commission in power undertakings and hydro-electric railways is $285,003,969 (approximately £57,000,000). About 757 municipalities obtain power from the commission.

Chalfont St. Giles.—IMPROVED STREET LIGHTING.—The Lighting Committee proposes to extend and improve the electric street-lighting system for the coming winter.

Cheltenham.—LOANS.—The Electricity Committee has obtained sanction to borrow £12,700 for mains, £3,729 for sub-station equipment, and £2,812 for overhead lines for a supply of electricity to Birdlip.

China.—NEW POWER STATION.—The Canton Municipal Government has recently signed a contract with the Siemens (China) Co. for the equipment of a new 30,000-kW electric power station. The new works will be installed by 1935 at Sai Chuen, on the western outskirts of the city, and will supply power for use within the city. Power outside the Canton area will be provided by the new hydro-electric plant to be erected at Yung Kiang, a tributary of the North River. Three German engineers are now at Yung Yuen preparing designs for the new station in collaboration with experts from the Provincial Department of Reconstruction.

Colchester.—SUPPLY EXTENSION.—The Electricity Committee is to provide a supply to Inworth, including the proposed waterworks pumping station of the Lexden and Winstrees Rural District Council, at an estimated cost of £1,298. The existing a.c. main in Bourne Road is to be extended along Mersea Road as far as Pownall Crescent at an estimated cost of £448.

Doncaster.—NEW EQUIPMENT.—The Corporation is inviting tenders from certain approved contractors for sub-station buildings, switchgear and transformers for the Scawthorpe and Bennetthorpe housing estates and transformers for a sub-station.

Dover.—REDUCED CHARGES.—The Town Council has reduced the charge for electricity for heating and cooking and all domestic purposes other than lighting to 1d. per kWh.

Eastbourne.—SUPPLY TO HAILSHAM.—The Electricity Committee is to complete the secondary means of supply to Hailsham at an estimated cost of £633.

SUB-STATION.—The Committee has purchased a site at Stone Cross for the erection of a sub-station.

Ebbw Vale.—REDUCED CHARGES.—The Urban District Council has reduced the prepayment-meter charge by ½d. per kWh. Similar reductions have been made for ordinary lighting, and for churches, chapels, schools and public offices. For heating and cooking the kWh charge is reduced from 1½d. to 1¼d.

Glasgow.—MAINS EXTENSIONS.—The Electricity Committee has decided to lay distributing mains at a cost of £1,316.

X-RAY APPARATUS.—The Health Committee has agreed to the purchase, as suggested by the Medical Officer of Health, of X-ray equipment for Stobhill Hospital at an estimated cost of £2,600.

Gloucester.—SUPPLY EXTENSION.—The City Council has applied for a loan of £1,152 for extending the mains to Quedgeley and providing and equipping a sub-station. The supply is for a number of houses which are now in course of erection.

Greenwich.—LIGHTING INSTALLATIONS.—The Borough Council has contracted with the South Metropolitan Electric Light & Power Co., Ltd., for the lighting of six miles of main roads in the borough, in place of the previous gas lighting, by "Osira" gas-discharge electric lamps. This follows the installation of this system of street lighting at Lewisham, and the total number of lamps of this kind now amounts to 476.

Hastings.—ELECTRIC PUMPING.—The Water Committee is to develop water resources at Sedlescombe by the provision of an electric pumping station at an estimated cost of £1,500.

SUPPLY EXTENSION.—The Electricity Committee has arranged to provide a supply, at a cost of £3,583, to the South-Eastern Brick Co., Ltd., at Ninfield, where new brickworks are to be established. The company guarantees an annual consumption to the value of not less than £1,200 per annum.

ELECTRICAL DEVELOPMENT.—The Town Council is applying for a loan of £10,000 for house services.

LAKE ILLUMINATION.—The boating lake is to be illuminated with twelve standards and coloured lights at a cost of £500, plus 3s. 1½d. per hour for electricity consumption.

Ilminster.—CHURCH LIGHTING.—The Parochial Church Council has decided to have the Parish Church lighted by electricity and the chancel floodlighted. St. Mary's Hall is also to have electric light.

King's Lynn.—SUPPLY TO MARSHLAND DISTRICT.—The Town Council is to apply for sanction to a loan of £25,000 in connection with a scheme for supplying electricity to the marshland district.

Kirkwall (Orkney).—SUPPLY EXTENSION.—The Corporation electricity service is to be extended to Berstane Road, a thoroughfare outside the burgh boundary.

Leicester.—POWER STATION IMPROVEMENTS.—The Electricity Committee announces that the Central Electricity Board has directed the extension of the plant at the generating station by the installation of a boiler having a maximum continuous capacity of 175,000 lb. an hour, and it asks for permission to apply for a loan of £88,000.

SUB-STATION.—The Electricity Committee is to erect a sub-station at Rowlatts Hill.

Lincolnshire.—OVERHEAD LINES.—The Mid-Lincolnshire Electricity Co. is to erect cables at Coningsby and Tattershall.

London.—REDUCED CHARGES.—The County of London Electric Supply Co., the South Metropolitan Electric Light & Power Co., Ltd., and the South London Electric Supply Cpn., Ltd., have announced that the business "all-in" fixed charge will be reduced by 20 per cent. and the running charge from ¾d. to ½ per kWh. Under the domestic "all-in" tariff there will be a similar reduction in the running charge. Thus, throughout the large London area under the control of these companies the standard rate per kWh is to be ½d. for all domestic and business purposes.

Marlow.—ELECTRICITY PREFERRED.—The Marlow Urban District Council has decided to accept the tender of the Cookham & District Electricity Corporation, Ltd., for electric street lighting in the district's added areas in preference to a tender of the Uxbridge, Maidenhead, Wycombe & District Gas Co.

North Wales.—BULK SUPPLIES.—The North Wales and South Cheshire J.E.A. has passed a resolution declaring that its ability to fulfil its functions depends upon obtaining more equitable terms for bulk supplies from the grid, and stating its intention to use every effort to secure an amendment of the electricity scheme with that object in view.

It was stated at the last meeting of the Authority that some time ago Chester Corporation applied to the Electricity Commissioners for a permit to supply electricity in bulk to the Hawarden Rural District Council. The Commissioners advised the Hawarden Council to approach the North Wales Power Co. on the question of terms, but were later pressed by Hawarden to decide in favour of an order for a supply from Chester. The Commissioners, pointing out that the granting of such an order would result in a transference of load from the North Wales and South Cheshire district, asked for the opinion of the joint authority on the matter. It was decided to reply that the authority was not agreeable to Hawarden's going out of the supply area at present.

The Commissioners have asked for the observations of the North Wales & South Cheshire J.E.A. on the submission that distribution powers should be exercised in certain areas of the Mold rural district, and in the parish of Nerquis, on the ground that no electricity supply has been provided. The Commissioners point out that a petition signed by 176 residents in the Gwernaffield and Pantymwyn districts has been received stating that many houses had been wired in anticipation of facilities being provided, and complaining that these districts have been unfairly treated. It was reported that the North Wales Power Co. proposed to construct an inter-connecting transmission line, with a view to further distribution schemes being carried out, with an assurance that the work would be put in hand within a year.

Orpington.—The Urban District Council has approached the West Kent Electric Co., Ltd., as to the desirability of expediting the supply of electricity to the outlying parts of the district, and the company has intimated that the Council's views will be submitted to the directors at the next meeting of the board.

Oxford.—REWIRING SCHEME.—The Estates Committee is to rewire the municipal buildings at a cost of £1,550 and provide new fittings at a cost of £600.

POWER STATION REPAIRS.—The Electricity Committee is to repair the mechanical stoker at a cost of £1,300 and install a battery and booster at the power station at a cost of £500.

Preston.—REWIRING SCHEME.—A scheme has been drawn up for the lighting and rewiring of the Guildhall. The work will be done by the borough electrical engineer at a cost of £750.

Reigate.—SPECIAL ORDER.—The Town Council is to approach the Commissioners with a view to promoting a Special Order to supply electricity to the parish of Gatton.

Rugby.—REDUCED CHARGES.—The Town Council has adopted the following new tariff:—Lighting, first 1,000 kWh per quarter at 4d., from 1,001 to 1,500, 3d., with a minimum charge of 7s. 6d. per winter quarter, and 2s. 6d. per summer quarter; alternative shop lighting, fixed annual charge of £10 per kW of lighting installed, plus ½d. per kWh; cinemas and theatres taking whole supply, 1½d.-3d. per kWh according to consumption; late hour shop lighting, 2d.; heating and cooking, continuous supply, 1d.; restricted hour supply, ½d.; power, first 200 kWh per quarter, per h.p. installed, 1d., beyond ½d.; two-part tariff for private dwelling houses, ½d. for lighting, cooking and heating; h.p. supply, below 50,000 per annum, 1½d., between 50,000 and 250,000, 1d., beyond, all at 0.8d.; off-peak h.p. supplies to consumers, ½d.

TERMINATION OF AGREEMENT.—The Council has decided to give notice to the Leicestershire & Warwickshire Electric Power Co., Ltd., terminating the existing implied agreement between the two bodies at the end of the year, and to make formal demand to the Central Electricity Board for an indirect supply through the Power Co.'s transmission lines from the beginning of 1935. The Council alleges that the company is endeavouring to force the Corporation to pay a higher sum for electricity than that which it is entitled to charge.

Settle.—STREET LIGHTING.—The Parish Council has decided to substitute electric lighting of the streets in place of the existing gas lighting.

South Shields.—CHANGE OF FREQUENCY.—The North-Eastern Electric Supply Co., Newcastle, which supplies electricity in bulk to the Harton area, is proposing to change the frequency of supply at an early date.

SUB-STATIONS.—The Town Council is to spend £912 on erecting four sub-stations at the police buildings, Stanley Terrace, Ravensworth Terrace, and on the West Harton housing scheme.

Sedbergh (Yorks).—SPECIAL ORDER.—The Electricity Commissioners have submitted to the Minister of Transport a Special Order made on the application of Mr. J. J. Martin, London House, Sedbergh, to authorise the supply of electricity in Sedbergh.

Stirlingshire.—SCHOOL LIGHTING.—The Education Committee has approved of the installation of electric lighting in a large number of schools at a cost of £7,499.

Stonehaven (Kincardineshire).—STREET LIGHTING CONVERSION.—The Town Council has decided to change over the street lighting from gas to electricity. The work is to be carried out as soon as possible.

Taunton.—LOAN SANCTIONED.—The Town Council has approved an application to the Electricity Commissioners for sanction to borrow £1,000 for the purchase of static condensers and the necessary switchgear and installation to improve the power factor of the municipal undertaking.

Walsall.—MAINS EXTENSIONS.—The Electricity Committee recommends the extension of distribution mains at an estimated cost of £3,862.

Walton and Weybridge.—EXTENSION.—The Urban Council is to supply electricity to a new housing estate at Walton, at an estimated cost of £2,000.

West Wycombe.—WHEELER END.—Provided permission is obtained to erect overhead lines, the High Wycombe Electric Light & Power Co. is to give a supply of electricity to Wheeler End.

Weymouth.—CHARGE REDUCTION.—The Town Council has reduced the charge for lighting within the borough from 5½d. to 5d. per kWh, with discount, and the bulk supply to the Portland Urban Council from 0.7d. per kWh to 0.5d.

Wimbledon.—SUB-STATION ALTERATIONS.—The Electricity Committee is to undertake alterations to various existing sub-stations at an estimated cost of £600, sanction to borrow this sum having been obtained.

Wolverhampton.—MAINS EXTENSIONS.—The Electricity Committee is to extend the electricity distributing system (£1,464) and provide a supply to Upper Westbeech (£200), White Ladies Farm, Boscobel (£102), and Lower Brockhurst (£195).

SYSTEM CONVERSION.—The Electricity Committee has approved a scheme by the borough electrical engineer for converting the existing two-phase system in the Trysull Road area to three-phase (£926).

Traction

Canada.—TROLLEY-BUSES FOR MONTREAL?—It appears that trolley-buses are being considered by the authorities in Montreal. They have already been operated successfully in Chicago and Indianapolis, but the snow and ice conditions which prevail in Montreal at certain times of the year may render their use impracticable.

France.—ELECTRIC VEHICLES IN A MOTOR TRIAL.—No fewer than eleven electric trucks and dust-collecting trucks took part in the recent French automobile trial known as the Rallye des Carburants Nationaux. They comprised a 2-ton Panhard, a 30-cwt. Renault, a 24-cwt. Automatic, a 24-cwt. Fenwick, a 24-cwt. Satme, one 2½-ton and two 5-ton Sovels, a 5-ton and 6-ton Vetra, and a 5-ton Maf. Being intended for use over a limited distance, the trials of the electric vehicles were held in Paris, during the course of which they had to climb up to the Sacré Cœur, Montmartre.

PARIS TRAMWAYS TO GO.—A loan of 60 million fr. has been floated recently by the Société des Transports en Commun de la Région Parisienne for the provision of motor buses to replace the present tramways.

Germany.—RUBBER IN TRAMCAR WHEELS.—In a recent issue of the *Schweizerische Bauzeitung* some particulars are given of the trials with the use of rubber buffers in the wheels of tramcars which have been carried out in Frankfurt-am-Main. It is stated that such wheels effect a material reduction in noise and jolting, and especially in the whistling and scraping noise which occurs when trams are passing round curves. Rubber-inserted wheels have now been used for a distance of over 40,000 miles, and it is asserted that they are effecting a reduction in tram rail wear and will permit of tramcars of lighter construction.

Italy.—TROLLEY BUS TRIALS IN MILAN.—The municipal tramways department of Milan has for some time past been conducting trials of three different types of electric trolley buses placed at its disposal by three different manufacturers, viz.: a 70-passenger bus by the Compagnia Generale, in conjunction with the Fiat Co., built under licence from the American General Electric Co., a six-wheel bus by the Stigler Co., accommodating 120 passengers, built under licence from Ransomes, Sims & Jefferies, Ltd.; and one by Ing. Turrinelli, of Milan, one of the pioneers of electric vehicles in Italy.

RECENT ELECTRIFICATION WORKS.—During the past year the Italian State Railways have spent 27,000,000 lire on electrification work, compared with 54,000,000 lire in the previous year. In the same period, twenty-four electric locomotives and six motor coaches were placed in service, and a further seventy-three locomotives and two motor coaches ordered. The number of electric locomotives now in service is 967.

Japan.—TRAMWAY PROJECT.—Our Yokohama Correspondent reports that the Wakamatsu Municipality intends to run an electric tramway in the city, and has applied to the Government for a loan for the purpose.

RAILWAY ELECTRIFICATION.—Another message states that on June 28th the Meguro-Kamata Electric Railway Co. and the I Kegami Electric Railway Co. held an extraordinary general meeting at which it was resolved to combine the two companies. The I.G.R. has decided to electrify the Funabaski-Chiba section of the Sobu Railway in 1935 at a cost of 3,500,000 yen.

Newcastle-on-Tyne.—TROLLEY-BUS BILL APPROVED.—Royal Assent has been given to the private Bill promoted by the City Council to secure powers to introduce a trolley-bus service between Benwell and Wallsend, a distance of six miles. The Transport and Electricity Committee has discussed plans for the ordering of a fleet of about thirty trolley-buses in readiness for the service, which it is expected will be in operation by the end of March, 1935.

Portsmouth.—PROTECTION OF TRAMS.—In spite of the City Council's strenuous efforts to secure further protection for the Corporation tramway undertaking, the Traffic Commissioners for the South-Eastern area have renewed the licences of the Southdown Motor Services with the same protective fares as agreed upon in 1932. The sole concession made to the City Council is that the Southdown Co. is to be required to raise its monthly season charge.

Rumania.—RAILWAY ELECTRIFICATION.—The main railway line connecting Bucharest with Vienna, Paris and London is to be electrified between Campina, at the foot of the Carpathians, on the east, and Brashov, at the foot on the west. Tenders from interested companies, says *Reuter*, should be submitted to the Ministry of Communications in Bucharest. The distance to be electrified is about fifty miles, and includes some very steep hills. The estimated cost of the work is more than £1,000,000.

Russia.—ELECTRIFICATION ACTIVITIES.—During 1933 twenty-four electric locomotives were put into service on the Soviet railways, sixteen of which were built in Russia. At the end of the year 325 miles of track were electrified, all on the d.c. system, and a further 575 track miles were under conversion. An important new electric line has recently been opened between the Kuss Basin and Novosibirsk, and this line will carry a heavy mineral traffic. An experimental line (20,000 V d.c.) is under construction near Moscow.

Traffic Signals.—Leicestershire County Council is considering the erection of traffic signals at Syston.

The Colchester Corporation is to install traffic control signals at the junction of St. Andrew's Avenue and Elmstead Road (£450).

Sutton and Cheam Urban District Council proposes to install traffic signals at the junction of the Banstead Downs-New Malden road with the London-Worthing road.

The Luton Town Council has accepted the tender of the Automatic Electric Co., Ltd., for traffic control lights at Christ Church junction at £666.

United States.—ACCIDENTS ON ELECTRIC RAILWAYS.—The number of accidents on electric railways was reduced from 2,283 in 1932 to 1,867 in 1933, while the number of fatalities fell from eleven to four.

Communications

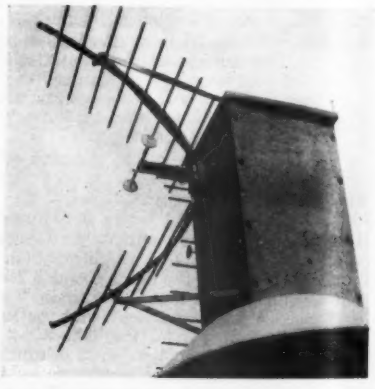
China.—TELEPHONE NETWORK.—According to the *Chinese Economic Bulletin*, an agreement for a loan of £200,000 for the institution of a long-distance telephone system linking up the nine provinces of Kiangsu, Chekiang, Anhui, Kiangsi, Hupeh, Hunan, Honan, Hopei and Shantung will shortly be signed by representatives of the Ministry of Communications and the Board of Trustees of the British Boxer Indemnity Refund.

Czechoslovakia.—NEW RADIO STATION.—A new wireless station with a power of 6 kW is to be erected between Kosice and Uzhorod. It will operate on 269.5 metres.

Great Britain.—RADIO RELAY SERVICES.—The Orpington Urban District Council has refused an application by the Commodore Cinema (Orpington), Ltd., for permission to relay radio programmes to subscribers on the ground that the erection of overhead lines would be detrimental to the area.

Northern Ireland.—BELFAST.—The Corporation has decided to permit the inauguration of a system for the rediffusion of radio programmes throughout the city. The Improvement Committee is to invite tenders for the right to operate a system.

Palestine.—RADIO STATION.—The Palestine authorities have decided to provide a broadcasting service in the country. Plans for the new service are already well advanced, and a site for the broadcasting station has been selected about seven miles north of Jerusalem. The task of constructing and installing the new station has been entrusted by the Palestine Department of Posts and Telegraphs to the Marconi Co., and manufacture of the equipment has started at the Marconi Works at Chelmsford.



Last week we described the experiments carried out by the Marchese Marconi in navigating his yacht by wireless (p. 162). The illustration now reproduced shows the special aerial system fitted to the "Elettra"

The power of the new station is to be 20 kW unmodulated aerial energy, and broadcasting will be effected on a wavelength of 449.1 metres. The transmitter, which will be adjustable from 200-545 metres so that a change of wavelength can easily be made should this be desired at a future date, consists of a number of aluminium panels placed in line, on which the controls and measuring instruments are mounted. The transmitting valves, with their associated wireless circuits, are behind the panels, with safety gates on both sides to prevent unauthorised access. A control desk placed in front of the panels is used for the supervision of the power supply and other circuits.

A high-precision quartz crystal oscillator for stabilising purposes is provided, its constancy being five in one million.

An inverted quarter-wave aerial of the "T" type, suspended between two lattice-steel masts, is to be used. The masts are 100 metres in height.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—MELBOURNE.—Posts and Telegraphs Department. September 4th. Telephone tags, connection plates, strips and terminals. (A.Y. 12497.)* Vitreous resistances. (A.Y. 12473.)* Telephone switchboard plugs and sleeves. (A.Y. 12472.)*

August 21st. Telephone terminal strips. (A.Y. 12534.)*

September 11th. Telephone instrument cords. (A.Y. 12506.)* Condensers of various capacities. (A.Y. 12500.)*

September 18th. Telephone receivers together with spare ear pieces, &c. (A.Y. 12501.)* Telephone switchboard cords. (A.Y. 12536.)*

October 17th. Victorian Railways. Selector telephone equipment consisting of a control office with thirteen radiating lines. (A.Y. 12532.)*

TOWNSVILLE.—October 11th. One 1,000-kW self-contained turbo-alternating unit complete with exciter auxiliary plant and all necessary instruments and fittings. (A.Y. 12535.)*

Azores.—PONTA DELGADA.—November 5th. Municipal Council. Hydro-electric plant comprising Francis turbine, 3-phase alternator, oil-cooled transformer, switchgear, &c. (A.Y. 12504.)*

Barnes.—September 12th. Corporation. Traffic control signals. (See this issue.)

Beckenham.—August 27th. U.D.C. L.p. cable requirements until December 31st, 1934. (July 27th.)

Bedford.—August 20th. Electricity Department. Supply during twelve months of meters, water heaters, cookers, kettles, and other appliances. (July 20th.)

Blackburn.—August 14th. Installation of electric light at the Market Hall. Borough engineer, Town Hall.

Bournemouth.—August 25th. Corporation. Thirty-six six-wheeled, double-deck trolley omnibuses. Specifications from Engineer, Transport Offices, Wootton Gardens (deposit £2 2s.).

Brighton.—September 10th. Corporation. One 30,000-kW turbo-alternator with condensing plant and auxiliaries, and one 150,000-lb. steam-raising unit. (See this issue.)

Bristol.—September 7th. Electricity Department. Four 130,000-lb. steam raising units. (August 3rd.)

Bromley (KENT).—August 21st. Electricity Department. Seventy street lighting standards. (See this issue.)

Cardiff.—August 25th. Electricity Department. 33-kV cable and metal-clad switchgear, four 15,000-kVA transformers, and lamps. (July 27th.)

Cheadle & Gatley.—August 23rd. Electricity Department. Medium-pressure switchgear, 350-kVA transformer and 6.6-kV switchgear. (See this issue.)

Congleton.—August 31st. Electricity Department. One 500-kVA, 3,300/400-V indoor type transformer. (August 3rd.)

East Africa.—MOZAMBIQUE.—October 15th. Port and Railway Administration. Gas producer, motor, alternator, and distribution board. (G.Y. 14075.)*

East Dereham.—August 23rd. Electricity Department. 11-kV and l.p. overhead lines. (See this issue.)

Egypt.—CAIRO.—August 15th. Ministry of the Interior. Single-phase, single-tariff meters. (A.Y. 12440.)*

August 14th. Materials in connection with the installation of a distribution sub-station at Calioub. (A.Y. 12476.)*

August 15th. Electricity Department. Oil-immersed self-cooled transformers. (August 3rd.)

October 18th. Egyptian Government. Three complete electric pumping stations, with machinery and accessories at Fua, Balamoan and Serw. Chief Inspecting Engineer, Egyptian Government, 41, Tothill Street, S.W.1 (non-returnable deposit £3 1s. 6d.).

Ennerdale.—August 15th. Rural District Council. Wiring of seventy-eight houses, Moresby Parks House Estate. Particulars from engineer's office, 81, Lowther Street, Whitehaven.

Hastings.—August 15th. Electricity Department. Electricity meter-testing equipment. (July 27th.)

Kettering.—August 27th. Electricity Department. Supply and erection of public lamps with extended arms for central suspension. (August 3rd.)

Lancashire.—August 21st. County Council. Reorganisation of the electrical installation of Lancaster Grammar School. Clerk to the Council, Preston.

London.—FULHAM.—September 4th. Borough Council. Rewiring and modernising of the electrical installation in the old portion of the Town Hall. (See this issue.)

Louth.—August 14th. Electricity Department. One 500-kVA transformer, 22-kV isolating switchgear and e.h.p. cables. (August 3rd.)

Manchester.—August 20th. Electricity Department. Low-pressure valves for circulating water system at Stuart Street power station. (See this issue.)

August 27th. Low-pressure circulating water pipes, supports, &c., at Stuart Street power station. (See this issue.)

Newport (Mon).—August 13th. Electricity Department. Two water-tube boilers, with super-heaters, &c. (July 13th.)

Newport (I.O.W.).—August 15th. Town Council. Two electrically driven booster pumping sets. Sandford, Fawcett & Partners, 53, Victoria Street, London, S.W.1.

New Zealand.—Dunedin Corporation. September 12th. Three 150-kVA and three 100-kVA, three-phase, oil-cooled, outdoor transformers. (A.Y. 12523.)* Voltage regulators for use on a 6,600-V 3-phase circuit. (A.Y. 12524.)*

WELLINGTON.—September 11th. Post and Telegraph Department. Forty miles of insulated and braided bronze wire in 440-yd. lengths. (A.Y. 12526.)*

September 12th. Forty miles of flameproof jumper wire (2-12½). (A.Y. 12528.)* 100 miles of 1/0.044 in. and 30 miles of 1/0.036 in. v.i.r. twisted pair, tinned copper wire. (A.Y. 12529.)*

September 13th. Paper-insulated lead-covered cables and armoured telephone cables. (A.Y. 12527.)*

August 20th. 750 microtelephone handles. (A.Y. 1453.)*

Public Works Department. August 21st. Sixteen 300-W outdoor station lighting fittings. (G.Y. 13999.)*

August 21st. Battery-charging equipment comprising rectifying plant, together with control panel. (A.Y. 12533.)*

Normanton (YORKS).—August 25th. Re-wiring at Aketon Hospital buildings. J. W. Martin, Clerk, Normanton and District Isolation Hospital Committee, Council Offices, Normanton.

Northern Ireland.—BELFAST.—August 13th. Belfast Corporation. Electric lighting installation at Carpenters' Shop, Queen's Bridge. Tender forms and conditions from the City Surveyor's Department, Room 83, City Hall, Belfast. (Deposit of £1 1s.) Tenders to the Town Clerk.

Plympton St. Mary.—September 1st. Rural District Council. Supply and erection of h.v. switchgear, pole transformers, 6,300-V overhead lines, medium- and low-voltage overhead and underground distribution mains, &c., in connection with the extension to Tamerton and Roborough. Details from the electrical engineer, Council Offices, Plympton.

Reading.—August 27th. Electricity Department. Three 4,000-kVA transformers and 11,000-V metal-clad switchgear. (August 3rd.)

Salford.—August 18th. Electricity Department. Mercury-arc rectifier. (August 3rd.)

Siam.—BANGKOK.—August 31st. Royal State Railways. Cable and wire. (A.Y. 12489.)*

Sheffield.—September 18th. Electricity Department. Cooling towers and civil and constructional engineering work at Blackburn Meadows generating station, and civil and constructional engineering work at Neepsend power station. (August 3rd.)

South Africa.—CAPE TOWN.—Electricity Department. August 29th. 6,000 porcelain weatherproof pole fuses for consumers' service connections. (A.Y. 12499.)* 3,000 single-pole ironclad service cut-outs. (A.Y. 12518.)*

August 22nd. Power, pilot and telephone cables with joint boxes and jointing material. (A.Y. 12509.)*

JOHANNESBURG.—Municipality. August 18th. Black double-braided weatherproof hard-drawn copper conductors for overhead transmission lines. (A.Y. 12496.)*

August 25th. Outdoor type isolating links for the year commencing January 1st, 1935. (A.Y. 12517.)*

PRETORIA.—Government Supplies Board. August 17th. Telephone terminal blocks, indoor-type protectors fitted with carbons and fuses, and plunger or lever hold-down type switches. (A.Y. 12471.)*

PORT ELIZABETH.—September 17th. South African Railways and Harbours. Pumping equipment for Port Elizabeth harbour. (G.Y. 14113.)*

Southampton.—August 21st. Electricity Department. One 25,000-kW turbo-alternator and two 160,000-lb. boilers. (July 13th.)

Southend-on-Sea.—September 3rd. Electricity Department. Supply for a period of two years of h.p. and l.p. underground cables. (July 27th.)

Sunderland.—September 3rd. Electricity Department. Paper-insulated cable, rubber-insulated wire, meters and lamps. (August 3rd.)

Swansea.—August 17th. Electricity Department. Two batteries, one motor generator and two oxide film metal rectifiers for Tir John power station. (July 27th.)

Wallasey.—Electricity Department. Supply, laying and connecting e.h.p. cables. (August 3rd.)

West Riding.—Education Committee. Installation of electric lighting, Braithwell Council School. A. J. Dempster, Divisional Clerk, Winchester House, Scot Lane, Doncaster.

Worthing.—August 20th. Corporation. Seven sets of electrically driven, vertical, unchokeable, centrifugal sewage pumps and one centrifugal borehole pump. Specifications from J. Taylor & Sons, Caxton House, Westminster, S.W.1 (deposit £5); tenders to Town Clerk's Office, Town Hall.

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* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Aberdeen.—Electrical installation in connection with the new housing scheme at Seaforth Road (£394).—Stroud & Weir.

Blackpool.—Highways Committee. Electrical installation at properties in Stanley Terrace.—J. W. Fielding & Co.

Cheltenham.—Electricity Committee. Accepted. Cables for twelve months.—Hackbridge Cable Co., Ltd.

Doncaster.—Accepted. Underground cables (£1,230).—Enfield Cable Works, Ltd.

Dunstable.—Town Council. Accepted. Installation of electric light at the hospital (£115).—Griffin Bros. (Leighton Buzzard).

Education Committee. Accepted. Electric arc welding equipment for Stow College (£793).—Quasi-Arc Co., Ltd.

Corporation. Recommended. Electric pedestal crane for coaling the T.S.S. *Shieldhall* at Dalmuir Works (£768).—Sir W. Arrol & Co., Ltd.

Ealing.—Works Committee. Accepted. Automatic telephone extensions at the town hall (£74).—Siemens Bros. & Co., Ltd.

Highways Committee. Accepted. Traffic signals at South Ealing Road (£750), including ten years' maintenance.—Siemens & General Electric Railway Signal Co., Ltd.

East Ham.—Education Committee. Accepted. Installation of electric light at Dersingham school (£120), Avenue School (£220), and Shaftesbury school (£290).—Harland & Wolff.

Epsom.—Urban District Council. Accepted. Cables for the supply to the L.C.C. mental hospitals (£4,176).—Hackbridge Cable Co.

Glasgow.—Education Committee. Accepted. Electrical work at High School (£832).—D. A. M'Larty & Co.

Electricity Committee. Accepted. Six transformers (£225 each).—Brush Electrical Engineering Co., Ltd.

Sewage Committee. Accepted. Electric crane at Dalmuir works (£768).—Sir William Arrol & Co., Ltd.

Transport Committee. Accepted. Lead-covered cable for subway.—Craigpark Electric Cable Co., Ltd.

Lanarkshire.—County Council. Heating of St. Margaret's School (£1,238).—G. N. Haden & Sons, Ltd.

Leicester.—Markets Committee. Accepted. Electrical installation at fish market (£111).—Perkins & Spencer, Ltd.

Electricity Committee. Recommended. Installation of boiler plant at power station (£79,500).—International Combustion, Ltd.

Estates Committee. Accepted. Converting Town Hall lift to automatic control (£114).—Waygood-Otis, Ltd., London.

Leeds.—Health Committee. Cold storage chamber at Meanwood Park Colony (£212).—Sun Electrical Co., Ltd. Cables: W. T. Henley's Telegraph Works Co., Ltd. (£561); Edison Swan Cables, Ltd. (£920); Hackbridge Cable Co., Ltd. (£1,049); Macintosh Cable Co., Ltd. (£148); Metropolitan Electric Cable & Construction Co., Ltd. (£473); Telegraph Construction & Maintenance Co., Ltd. (£312).

Lancashire.—County Council. Contracts Sub-Committee. Recommended. Electric lamps.—Ensign Lamps, Ltd. (£451), and G. P. Dennis, Ltd. (£457).

Manchester.—Education Committee. Accepted. Electrical installation at Darlington Street Housewifery Centre.—A. Loudon.

Northern Ireland.—BELFAST.—Education Committee. Accepted. Electric lighting installations at Belmont P.E.S.—Messrs. G. McCartney & Co. (£68). At Avoneil P.E.S.—James McCaughey (£353).

Notts.—Health Committee. Accepted. Replacing battery cells at Ransom Sanatorium (£294).—F. Lamb.

Salford.—Electricity Committee. Recommended. Rectifier equipment (£757).—Electric Construction Co., Ltd.

Southport.—Highways Committee. Accepted. A.c. motors for highway depôts (£467).—Brook Motors, Ltd. Electric hoist (£60).—Herbert Morris, Ltd.

South Shields.—Town Council. Accepted. Electrical fittings for 336 houses at West Harton (£1,300).—P. P. Harrison.

Town Council. Accepted. One 600-kVA transformer (£846).—Ferranti, Ltd.

Taunton.—Town Council. Accepted. Static condensers, total capacity 405 kVA (£891).—British Insulated Cables, Ltd.

Watford.—Electricity Committee. Recommended. Two kiosks (£241).—Lucy & Co.

Notes

The Interpretation of a Rule

In the Court of Session, Edinburgh, last week Lord Carmont gave a preliminary judgment, allowing a limited proof, in an action brought by Peter Crane, brushing contractor, Blackburn, West Lothian, against William Baird & Co., Ltd., coalmasters, Riddochill Colliery, Blackburn. Plaintiff is suing for damages in respect of injury by an electric shock at Riddochill Colliery. The respondents deny responsibility.

His Lordship, after dealing with plaintiff's allegations, said in order to protect a flexible cable it was necessary to disconnect and remove it some distance from the motor, and this was done under the instructions of the respondent's fireman. When the operations had been completed the cable was again connected with the motor by one of the plaintiff's staff. After the plug had been inserted the plaintiff withdrew it to see that it had been properly connected to ensure correct direction of rotation of the motor. The plaintiff, having reinserted the plug, proceeded to the gate-end box where he closed the switch, and so made the circuit alive. About an hour later he turned on the switch at the motor, and at the same time felt a slight electric shock. He immediately heard cries from workmen situated nearby, and thinking that they also had received shocks he immediately endeavoured to turn off the switch, and in so doing received a very severe shock which seriously injured him.

The respondents referred to Regulation No. 131, which they said provided that no one but an electrician or one specially authorised in writing should undertake the working of electrical plant, and they pointed to the plaintiff's admission that he, a brushing contractor, was operating the electrical plant without having any written authority to do so, and they asked his Lordship to draw the conclusion that the immediate cause of the accident was the plaintiff's own interference with the electrical apparatus which he was prohibited from touching. His Lordship considered that the regulation quoted by the respondents was not an absolute one. The prohibition in Regulation 131 was directed against persons without special authority undertaking any work where technical knowledge or experience was required in order adequately to avoid danger. The plaintiff was therefore entitled to prove that he operated the plant in accordance with the respondent's system of working as the best means of showing that the work did not involve any special knowledge or experience. His Lordship said that he could not hold that the plaintiff's admission amounted to a plain disclosure of contributory negligence such as would justify the dismissal of the action. The parties were agreed that, unless his Lordship dismissed the action on the ground stated, there should be an allowance of proof rather than a jury trial in view of the very technical character of the apparatus alleged to be defective. His Lordship allowed a proof limited to the case laid on breaches of statutory duty.

287,000-V Apparatus for Boulder Dam

Among the equipment recently ordered by the U.S. Federal Government for Boulder Dam, Colorado, are seven power transformers rated at 55,000 kVA at 287,000 V, which are to be manufactured at the Pittsfield, Mass., works of the General Electric Co. of America. The complete order is valued at about $1,000,000; the transformers will be water cooled, will weigh over 200 tons each, and will be approximately 32 ft. high, 20 ft. wide, and 13 ft. deep. In addition, eight new circuit-breakers are being built by the same company for the Boulder Dam-Los Angeles lines, also to operate at 287,000 V, which is one of the highest operating voltages now in use. These impulse breakers will have the very short operating time of 3 cycles (60-cycle basis). They will contain approximately 1,000 gallons of oil each, in contrast with about 23,000 gallons for 287-kV breakers of conventional design. The impulse breaker, which is a refinement of the oil-blast forms, is designed to have the oil driven across the arc baths under pressure by pistons actuated by the operating mechanism, instead of under pressure generated by the arc itself.

Sun Spots and Radio Telephony

Engineers responsible for the operation and maintenance of the overseas radio-telephone service in America are investigating the effects on the service of changes in solar activity, according to a report in the *Telegraph and Telephone Age*. It is noted that when there is a departure from normal transmission a change in the activity of the sun is usually observed. Unusual appearances in certain areas of the sun generally accompany such changes, the most conspicuous being sun spots. During the periods when these disturbances affect the earth the signal intensity of short waves is reduced. In the case of very long waves there is a slight improvement in the daytime, although they are somewhat lessened in strength at night. The European service is affected by these conditions to perhaps a greater extent than other services.

An International Electrical Congress

The full programme has now been issued of the fifth congress of the International Union of Producers and Distributors of Electricity which is to be held in Zurich from August 29th to August 31st and in Lausanne on September 5th and 6th, the intermediate days being devoted to visits to electric power stations and other places of electrical interest. The business of the congress will be divided into twelve groups in each of which a large number of papers, emanating from electrical engineers in all the Continental countries, will be read.

Among the reports and papers of outstanding interest are those on "The Efficiency of Modern Steam Boilers," by M. H. Bres, of the Union de l'Electricité, Paris, "Insulator Losses in Power Transmission Lines," by Signor Palestrino, of the Societa Idroelettrica Piemonte, Italy, and "The Causes and Reduction of Noise in Urban Power Distribution Systems," by M. L. Astier and Mr. P. Baron, of the Compagnie Parisienne de Distribution d'Electricité.

The Original Parsons Turbine

As this year marks the jubilee of the first Parsons steam turbine and high-speed dynamo, invented by the late Sir Charles Parsons in 1884, this historic machine is being prominently displayed near the entrance hall in the Science Museum, South Kensington, London, until the end of September. Alongside it has been placed a screen of fifteen transparencies showing outstanding achievements during the past fifty years of power generation by Parsons turbines on land and sea. Another screen bears a photograph of Orpen's picture of Sir Charles Parsons and a table giving year by year the steps in the progress of the steam turbine. Illustrations of the exhibit appear on page 183.

Appointments Vacant

Assistant sub-station attendant for Barking Corporation Electricity Department.

Teachers in electro-technology and electrical science (evenings) for the Great Eastern Mechanics' Institution.

(See our classified advertisements.)

Makers' Names Wanted

S.C.S. chokes, &c.

ESTON generators, meters, morse keys, &c.

FORD insulating material.

Address of the Jewel Battery Co., Ltd.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. C. B. Davies, whose report as acting commissioner upon the work of the Hydro-Electric Commission of Tasmania is dealt with on page 174 of this issue, was appointed to his present position upon the death of Mr. H. A. Curtis in May last year. The acting general manager of the Department is Mr. G. H. Lofts.

Mr. C. W. H. Glossop, M.P., has been elected a director of the Yorkshire Electric Power Co.

Mr. F. Lythgoe, general manager of the Rawtenstall Corporation transport undertaking, has been appointed general manager of the Middlesbrough transport undertaking at a salary of £700.

Mr. A. Watson, formerly with the Edison Swan Electric Co., Ltd., has been appointed sales representative in the South London district of Messrs. J. H. Tucker & Co., Ltd., as from August 23rd. Communications should be addressed to Mr. Watson at the company's London office, 22-23, D'Arblay Street, W.1.

Mr. G. Phillipson, who, as reported in our last issue, has retired from the Rochdale Corporation Transport Department, after twenty-six years' service, upon the abandonment of the tramways, has been presented by the administrative staff with an electric grand-daughter clock.

Mr. A. Withers, who has been sixty-one years with Messrs. F. & C. Osler, Ltd., Birmingham, has retired. Mr. Withers, who is seventy-five years of age, has been presented with an armchair by the staff and workpeople.

Capt. J. Coxon, M.I.E.E., consulting engineer, has removed to 65, New Street, Birmingham.

Mr. S. Smith has been appointed manager of Midland sales to the Benjamin Electric, Ltd., under the reorganisation of its sales force, and will assume, under the general sales manager, executive control of sales in that territory.

Mr. J. D. Knight, who retired last week from the post of borough electrical engineer at Ealing, has been presented by the staff of the Corporation Electricity Department with a radiogram. The presentation was made by Mr. W. R. Hicks, the borough surveyor, who said that Mr. Knight had served the Council for over forty-two years and for nearly forty years had been one of its chief officials. He commenced the installation of electricity in the borough and had guided the progress of the undertaking to its present success. A separate presentation is to be made to Mr. Knight by the works staff of the undertaking.

Mr. J. C. Mallen has been appointed manager of the Glasgow branch of Messrs. H. C. Rawson (Sheffield & London), Ltd., and has since August 1st assumed control of the company's entire Scottish business.

Mr. J. N. Atkinson, A.M.I.E.E., of the Edinburgh Corporation Electricity Department, has been appointed engineer and manager of the Wick Corporation Electricity Department, consequent upon the resignation of Mr. W. C. Roy. Mr. T. Gerrard, electrical engineer and manager of the Mirfield (Yorks) Urban District Council's electricity undertaking, was recently appointed to this position, but he subsequently withdrew. At the recent meeting of the Wick Town Council the voting was eight for Mr. Atkinson and seven for Mr. J. More, of Wick. On the previous occasion Mr. More also received seven votes against eight for Mr. Gerrard.

Mr. J. Hornby Jolly has been appointed a managing director of Messrs. Guest, Keen & Nettlefolds, Ltd., and **Mr. E. C. Drake,** chief accountant, has been appointed secretary of the company.

Mr. A. R. Cooper, who is the author of the article on "Mine Motor Ventilation," published on p. 176, was educated at Rotherham Grammar School and Sheffield University. He was a works pupil of Messrs. John Brown & Co., Sheffield and Clydebank, and later carried out work in connection with colliery and coke oven developments. He is now chief electrical engineer to Messrs. Pearson and Dorman Long, Ltd., who are developing part of the Kent coalfield. In 1933 Mr. Cooper was awarded a special premium by the I.E.E. (of which he is an associate member) for a paper on "Electricity in Mines," which was read before several provincial centres.

[*Elliott & Fry*

Mr. A. R. Cooper

Mr. L. Gardiner, fittings designer and lighting specialist, who, whilst with the General Electric Co., Ltd., has been associated with the lighting of many modern passenger vessels, has joined Messrs. Osler & Faraday, Ltd.

Obituary

Mons. G. Varangot.—The death recently occurred in Paris at the age of fifty-nine years of Mons. G. Varangot, the director of the commercial department of the Compagnie des Lampes, and secretary of the French Electric Lamp Manufacturers' Association. He was a leading French authority on electric lamps and had taken an active part in lamp standardisation.

Mr. N. J. Wilson.—The death occurred on July 31st, at his home in Chelsea, of Mr. Norman James Wilson, M.I.E.E.

An Underwater Cable-laying Feat

A CONTRACT for the supply and installation of two submarine cables across the Brisbane River, Queensland, for the City Electric Light Co., Ltd., was recently carried out by W. T. Henley's Telegraph Works Co., Ltd. The cables form a connecting link in an overhead 33,000-V transmission line running from the Brisbane City Electric Light Co.'s generating station at Doughby Creek to the centre of the city. The cables were 0.25 sq. in., 3-core, 33,000-V screened S.L. type, double wire armoured, served and compounded overall. Each cable was 500 yds. in length, and was delivered to site in one length on a drum of 20½ tons gross weight, to simplify laying and avoid any joints in mid-river. Three reinforcing strands of galvanised wire, built into the longitudinal interstices between the cores, form a special constructional feature. They provide a continuous lateral support for the cores throughout the length of the cable, together with great longitudinal strength. The three single cores were sheathed on the Henley straight-through lead press with a seamless lead sheath; and each sheath was lapped with two layers of compounded paper to protect the lead against corrosion and a layer of brass tape as protection against the attacks of tropical termites and the toredo.

Laying Henley cable under the Brisbane River

The armouring was treated with special termite-resisting compound, and another compound was used to prevent the servings becoming "tacky" during transit through the tropics and after erection. The installation work began with the salvaging of three obsolete submarine cables and the dredging in the river bed of a trench 11 ft. wide and 5 to 7 ft. deep, extending from the New Farm bank to the centre of the river and the commencement of the deep water shipping channel. The trench was excavated in mud and packed gravel, which was of a sufficient natural consolidation to withstand the flow of water. A shorter trench was also dredged out into the river from the East Brisbane bank to give the cables an

easy lead into the deep water of the main channel. The whole of the river bed was inspected by divers, who removed a number of obstructions from the trench, and had to take particular care close to the river banks and on the New Farm side of the deep water channel where there is a ledge with a sharp drop of eight feet. The dredging was done with a bucket grab and an extremely good bottom level was obtained. Loose boulders on both banks of the river were removed to eliminate risk of damage to the cable after laying, and approximately 5,200 tons of material were taken out.

The cables were laid across the river at a point where there is an easy bend and a width of about 400 yards. With high tides of approximately seven feet a maximum current of 3¼ knots is often experienced at this point, and with a westerly wind and a "fresh" in the river the ebb tide has been known to run out at 6 to 8 knots.

The strength and irregularity of the tidal currents was responsible for the decision not to use tugs and launches but to depend entirely on an 80-ton flat-bottomed scow-ended barge, fitted with a timber frame to receive the two drums in tandem. Cantilever brakes on the barge were operated by light blocks and tackles, and a series of 6-in. diameter rollers carried the cables from the drums and over the stern of the barge. A motor bilge pump was fitted to the barge as a precautionary measure and two crab winches and anchors also were carried to assist with berthing during the landing of shore ends.

Maintaining Position

Flexible steel hawsers each ¾ in. in diameter were carried across the river from bank to bank and anchored on one side to wooden blocks buried in the ground, and on the other side were pulled up with 15-ton crab winches prior to laying. The hawsers were erected 14 ft. apart and were supported in the river on two light punts which were fitted fore and aft with heavy crab winches and anchors, and anchored in midstream about 250 ft. apart in the line of the cable run. The punts could be hauled up and down stream and held in any desired position by the anchors and crab winches. Drift of the barge, due to wind or tidal pressure, was thus corrected. The hawsers passed through vertical rollers fitted fore and aft on the cable barge. The barge was hauled across the river by a small steam winch on the New Farm bank, its course across river being checked by theodolites.

To maintain an accurate course the two midstream punts were hauled upstream against the tide as the barge commenced to move away from the bank, and they were then manipulated to keep the barge on its course. The laying commenced from the East Brisbane side of the river, the cable barge being securely moored stern first to the bank at slack water (low tide). The required amounts of cable were pulled off directly over the stern of the barge and laid in the trench previously excavated. One cable was hauled up the terminal pole, the second being erected later.

The river was closed to all traffic, the hawsers were picked up off the bottom of the river and strained, and laying proceeded. The barge was securely moored on the New Farm side, and the shore ends were landed next morning by pulling the cables off the drums and supporting them vertically by a series of poles. The cable was passed from pole to pole up the river bank, the slack cable was fed along the bottom of the drums and both cables were completely rolled off and placed on cable rollers on the ground. A torrential rain fell continuously during the whole of the time and the steep river bank became a quagmire.

The cables were then moved to the side of the barge, and at the appropriate moment the first cable was lowered by ropes to the bottom of the river and received by the diver, who flaked it into the trench. At each shore end the cables were anchored just above low water mark to concrete blocks cast *in situ* and a special stocking grip ten feet in length was slipped over the cable, afterwards being thoroughly compounded and specially treated. The cables were run up the terminal poles and held in position by hard wood cleats packed with tarred felt. The "splitter box" in which the Henley reinforcing strands are anchored was erected on a channel iron cross-arm attached to the pole; and the three lead cores were separated and run to independent single core sealing bells arranged in line on another heavy channel immediately above. To protect the lead cores the two layers of paper and the brass tape remain undisturbed, with a further protection of a double layer of ozokerite tape applied hot. From the sealing bells solid circular copper busbars, each half-an-inch in diameter, run to the overhead line busbars, supported on pin insulators at the top of the pole.

The sub-contractors who supplied the necessary plant and labour were Messrs. M. R. Hornibrook (Pty.), Ltd., Adelaide Street, Brisbane, but the jointing of the cables to the sealing bells and the fitting and adjustment of the anchors, &c., was carried out by Henley's jointer from England. The work of replacing the stone pitching on the river banks was done in conjunction with the Harbours and Rivers Board under the direction of Henley's engineer, who was specially sent out from England to be responsible for the installation and handling of the cables.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Archibald Low Electrics, Ltd.—Private company. Registered July 30th in Edinburgh. Capital, £20,000 in £1 shares. Objects: To carry on the business of designers and manufacturers of and dealers in electrical or other heaters, fires, radiators, stoves and allied appliances, &c. The directors are: D. W. Low, B.Sc., 18, Helensburgh Drive, Glasgow, W.3, and J. Jardine, Bickleigh, Uddingston, Glasgow. Registered office: Carfin Road, Newarthill, Lanarkshire.

Television Instruments, Ltd.—Private company. Registered August 2nd. Capital, £100 in 1s. shares. Objects: To carry out any transactions in relation to the marketing of television apparatus, instruments and accessories of all descriptions, &c. The directors are: D. Simpson, Kiln Road, Thundersley, Essex, and R. F. Pellatt, 12, Carlton Drive, Leigh-on-Sea.

Metropolitan Electrical Equipment, Ltd.—Private company. Registered July 30th. Capital, £1,000 in 1,000 ordinary shares of 10s. each and 500 6 per cent. preference shares of £1 each. Objects: To acquire the business of manufacturers of and dealers in electrical equipment, cinema equipment and accessories carried on by R. H. Sweeney and D. J. Watson at 23, Severn Street, Deansgate, Manchester, as the City Electric and Radio Co. The first directors are: R. H. Sweeney, 17, St. Clements Road, Chorlton-cum-Hardy, Manchester, and three others. Registered office: Deansgate House, Deansgate, Manchester.

Robert Neill & Co. (Sheffield), Ltd.—Private company. Registered August 2nd. Capital, £7,000 in £1 shares. Objects: To carry on the business of manufacturers, repairers and factors of, and agents for, electrical accumulators, batteries, acids and containers, dynamos, motors, transformers, magnetos and electrical plant, wireless sets, &c. The first directors are: R. Neill, and Mrs. Maggie Neill, both of 14, Oakdale Road, Sheffield, 7, Registered office: 28, Trippett Lane, Sheffield.

Aurora Battery Co., Ltd.—Private company. Registered July 30th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers, exporters, importers and distributors of gramophones, radio-gramophones, voice and sound-producing and amplifying machines and instruments, automatic machines, batteries, wireless and electrical components, &c. The first directors are: J. B. Foster, 11, Evondale Road, Dulwich, S.E.15, and two others. Registered office: Ethelburga House, 91/93, Bishopsgate, E.C.

Midland Signs, Ltd.—Private company. Registered July 30th. Capital, £1,000 in £1 shares. Objects: To acquire the business of an electric and other sign manufacturer, assembler and electrical engineer carried on by F. G. Saul in Hertford Street, Coventry. The first directors are: F. G. Saul, 49, Browning Road, Stoke, Coventry, and C. Saunders, 67, Biggin Hill Crescent, Coventry.

Condor Electric Co., Ltd.—Private company. Registered July 20th. Capital, £500 in £1 shares. Objects: To carry on the business of electricians, manufacturers of generators and accumulators, suppliers and distributors of electricity, electrical and other energy for lighting, heating, and telegraphic, telephonic and wireless communications, &c. The subscribers are: F. H. Payne, 434, Ripple Road, Barking, E., and F. G. Thurgood, 18, Pembroke Road, Seven Kings. Secretary: Miss E. Hunter, 15, Norfolk Avenue, N.15. Registered office: Eldon Street House, 2, Eldon Street, E.C.2.

A.S.A., Ltd.—Private company. Registered July 30th. Capital, £1,000 in 500 ordinary shares of £1 each and 10 redeemable preference shares of £50 each. Objects: To carry on the business of electrical and radio engineers and contractors, sound equipment manufacturers and dealers, &c. The first directors are: W. E. Simmons, 20, The Avenue, Highams Park, E.4, and three others. Registered office: 223, Hoe Street, Walthamstow, E.17.

Barlow-Whitney, Ltd.—Private company. Registered July 31st. Capital, £5,000 in £1 shares. Objects: To carry on the business of inventors, constructors, installers and maintainers of plants and systems for electric heating, manufacturers of, agents for and dealers in electrical heating equipment control devices, electrical and engineering appliances, &c. The permanent directors are: H. D. Barlow, 19, Ladbroke Grove, W.11, and C. L. Whitney, 2, West Bar, Banbury, Oxon.

Radiographic, Ltd.—Private company. Registered August 1st. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electrical and mechanical appliances, gramophones, wireless apparatus and accessories, &c. The directors are: W. Wolsey, 169, Queen's Road, Finsbury Park, N.4, and S. W. Cohen, 4, Dalkeith Avenue, Glasgow, S.1. Registered office: 20, Chapel Street, W.C.1.

Wrights Midland Electrical Co., Ltd.—Private company. Registered August 1st. Capital, £2,000 in £1 shares. Objects: To acquire the business of wholesale dealers in wireless and radio goods carried on by W. Wright, H. Wright, and G. F. Wright, trading as "The Midland Electrical Co.," at 113, Coleshill Street, Birmingham. The first directors are: W. Wright, 225, Streetly Road, Short Heath, Erdington, Birmingham, H. Wright, 170, Heathfield Road, Handsworth, Birmingham, and G. F. Wright, 43, Chantry Road, Handsworth, Birmingham. Registered office: 113, Coleshill Street, Birmingham, 4.

Kamroe Radio Co., Ltd.—Private company. Registered July 30th. Capital, £1,000 in £1 shares. Objects: To carry on the business of electricians and general electrical engineers, heating, gas, water, lighting, radio, mechanical and general engineers, &c. The subscribers are: Miss R. Bilants, 96, Christchurch Avenue, N.W.6, and A. B. Kanes, 3, Landford Road, Putney, S.W.15. Solicitors: Rosenbloom, Dalton & Co., 4, Lloyds Avenue, E.C.3.

Returns of Electrical Companies

Troughton & Young, Ltd.—The nominal capital has been increased by the addition of £10,000 in £1 ordinary shares beyond the registered capital of £15,000.

Seaton & District Electric Light Co., Ltd.—Satisfaction in full on June 29th, 1934, of debentures dated June 30th, 1924, and March 14th, 1925, and registered July 5th, 1924, and March 23rd, 1925. (According to the register of mortgages, the debentures registered July 5th, 1924, and March 23rd, 1925, originally secured £5,000 and £1,000 respectively.)

North-Eastern Electric Supply Co., Ltd.—Satisfaction in full by various instalments between December 31st, 1921, and July 13th, 1934, of trust deed dated June 30th, 1909, and registered July 16th, 1909, and various supplemental trust deeds dated November 10th, 1914, to June 20th, 1930, and registered November 18th, 1914, to June 28th, 1930, securing £2,500,000 first mortgage debenture stock.

Supra Electra Motors, Ltd.—Issue of July 13th, 1934, of £200 debentures, part of a series already registered.

British Crystalite Co., Ltd.—Debenture dated July 24th, 1934, to secure £5,000 charged on the company's property, present and future, including uncalled capital. Holders: John Ismay & Sons, Ltd., Roden Street Works, Ilford.

Insulating Materials, Ltd.—Particulars filed of £1,200 debentures authorised June 14th, 1934, charged on the company's undertaking and property, present and future, including unpaid capital, the amount of the present issue being £400.

County of London Electric Supply Co., Ltd.—Capital, £12,000,000 in 3,500,000 6 per cent. cum. preference, 2,000,000 4 per cent. cum. preference, and 6,500,000 ordinary shares of £1. Return dated April 4th (filed July 26th), 1934. 3,381,925 6 per cent. preference and 5,707,109 ordinary shares taken up. £6,504,441 paid on 3,225,000 preference and 3,279,441 ordinary shares. £2,584,593 considered as paid on the remainder. Mortgages and charges: £5,500,000.

Wycombe (Borough) Electric Light & Power Co., Ltd.—Capital, £200,000 in 25,000 preference and 175,000 ordinary shares of £1. Return dated May 8th, 1934. 15,000 preference and 175,000 ordinary shares taken up. £172,000 paid on 15,000 preference and 157,000 ordinary shares. £18,000 considered as paid on 18,000 ordinary shares. Mortgages and charges, £40,000.

Erdington Electrical Co., Ltd.—Capital, £2,000 in £1 shares. Return dated April 27th, 1933 (filed March 13th, 1934). 1,000 shares taken up. £1,000 paid. Mortgages and charges nil.

William Geipel, Ltd.—Capital, £25,150 in 25,000 preference, 100 "A" ordinary, and 50 "B" ordinary shares of £1. Return dated May 10th, 1934. All shares taken up. £23,650 paid. £1,500 considered as paid. Mortgages and charges nil.

J.K.W. Manufacturing Co., Ltd.—Capital, £6,000 in £1 shares. Return dated May 9th, 1934. 3,100 shares taken up. £1,000 paid. £2,100 considered as paid. Mortgages and charges nil.

Wandleside Cable Works, Ltd.—The nominal capital has been increased by the addition of £15,000 in £1 ordinary shares beyond the registered capital of £20,000.

Whitchurch (Hants) Gas & Electricity Co., Ltd.—Particulars filed of £15,000 debentures authorised July 11th, 1934, charged on the company's property, present and future, including uncalled capital, the whole amount being now issued.

Arun Engineering Co., Ltd.—A. F. Sharp, 14, Gray's Inn Square, W.C.1, was appointed receiver and manager on July 16th, 1934, under powers contained in debenture dated January 13th, 1930.

Multi Relays, Ltd.—Capital, £3,000 in £1 shares. Return dated June 14th, 1934. 1,650 shares taken up. £1,650 paid. Mortgages and charges, nil.

Concordia Electric Safety Lamp Co., Ltd.—Issue on June 28th, 1934, of £1,000 debentures, part of a series already registered.

C. E. Greenwood, Ltd.—C. F. Phillips, electrical engineer, of 17, Eliot Vale, Blackheath, S.E., was appointed receiver on July 14th, 1934, under powers contained in debentures dated January 12th, 1934.

Hartley Engineering Co., Ltd.—E. H. Hawkins, of 4, Charterhouse Square, E.C.1, ceased to act as receiver and/or manager on behalf of the first and second debenture holders on June 21st, 1934.

H. W. Teeton, Ltd.—Capital, £4,000 in £1 shares. Return dated January 3rd, 1934. 3,870 shares taken up. £1,679 paid. £2,191 considered as paid. Mortgages and charges, nil.

City Notes

The London Passenger Transport Board has issued a provisional statement for the first financial year ended June 30th. This shows an estimated balance of revenue, after making certain provisions for reserves, of £4,778,782, and after providing for various charges there is a balance applicable to payment of interest on London Transport "C" stock of £708,738. This is sufficient to make a payment on account of interest for the year at the rate of 3 per cent. With the statement the Board has issued a memorandum in which it states that the work in connection with the preparation of the pooling scheme of the various transport undertakings has involved the extraction and compilation of a considerable amount of data, and it has not been possible, within the time stipulated in the London Passenger Transport Act, 1933, to complete the scheme. In addition, the London Transport stock to be issued in consideration for the transfer of certain undertakings to the Board has still to be determined, so that the total stock cannot yet be ascertained. In June last the Board promoted the London Passenger Transport (Interim Financial) Bill, in which it sought both an extension of the time within which the accounts of the Board for the first financial year must be prepared, audited and published, and authority to make a payment on account of interest on London Transport "C" stock in respect of the first financial year based on an estimated balance of the revenue applicable to the payment of such interest. This Bill received the Royal Assent on July 12th last. The memorandum includes a list of undertakings which had been transferred to the Board at the close of the financial year.

The Buell Combustion Co. reports a net loss for 1933 of £5,315, after crediting £1,070 profit on sale of investments, as against a profit of £1,110, after crediting £2,367 from sale of investments in 1932. The debit balance carried forward is increased to £23,784. The report states that activities during the year were confined principally to building up the organisation to cope with not only the pulverised fuel side of the business, but also to deal with the manufacture of Buttner dryers in this country. Recently negotiations were entered into and successfully concluded whereby the company has acquired the whole of the assets of Buell Combustion (Foreign), 90 per cent. of whose capital was already owned by the company. The auditors' report again states that they are not satisfied with the values at which the investment in the subsidiary company (£68,015), the unquoted investment (£2,971), the patents and patent rights (£77,173), and the development and experimental account (£19,092) appear in the balance sheet.

Christy Bros. & Co., Ltd.—Presiding at the annual meeting held on August 3rd Mr. F. Christy (chairman) said that the various companies with which they had operating agreements were all making satisfactory progress. The wireless relay undertakings at St. Neots, Huntingdon and Chelmsford were also developing satisfactorily. The former was already at a profit-earning stage, and the latter, although it had been in operation for only seven months, was approaching that stage. A considerable amount of general contracting work had been carried out in mills, factories, country houses, &c., including a number of pumping plants for water supply. An interesting contract during the past year had been the construction of the Morwellham hydro-electric plant for the West Devon Electric Supply Co., Ltd.

The Pennsylvania Water & Power Co. reports that the net earnings for the half-year ended June 30th available for dividends and general requirements were $1,064,060, as against $1,046,022 for the first half of 1933. The amount earned per share on the common stock was $2.45, against $2.41.

The North Wales Power Co. draws our attention to an error which appeared in the note in our last issue relating to its stock conversion offer. The new stock will bear interest at 3 per cent.—not 3½ per cent. as stated.

The Northampton Electric Light & Power Co., Ltd., has announced an interim dividend of 4 per cent. on the ordinary shares.

The Rushden & District Electric Supply Co., Ltd., has declared an interim dividend of 3½ per cent.

The Clyde Valley Electrical Power Co. is maintaining its interim dividend on the ordinary shares at 3 per cent.

Stocks and Shares

TUESDAY EVENING.

THE accumulation of capital in this country continues to make its weight felt, irrespective of holiday conditions, of Continental politics, and other considerations which might be supposed to exercise a depressing effect over Stock Exchange prices. So far as the markets for purely gilt-edged securities are concerned, it may be said that the absorption of stock goes on with almost monotonous reiteration every business day.

People continue to talk in a vague way of the probability that money will become dearer in the autumn, and that, on this account, a general fall in the prices of fixed-interest securities is not unlikely to take place. As though in ironical defiance of this prophecy, prices of such stocks and shares continue steadily to mount. The way in which the ordinary shares in the list of Home Electricity Supply companies maintain their prices demonstrates as clearly as anything can possibly do the confidence with which investment regards its soundest stocks. In spite of an outpouring of new issues unusually large for the time of year, the Stock Exchange broker finds that his difficulties increase daily in the way of finding for his clients such investments as shall give them a reasonable yield, combined with good security.

London Passenger Transport Board

The anxiously awaited announcement of the dividend on the London Passenger Transport "C" stock was made at the end of last week, and turned out to be 3 per cent. for the year that ended on June 30th last. This may be said to satisfy the anticipations raised by the more moderate of the estimates which had been framed in advance. Airy optimism

which spoke of a possible 5 per cent. had found little support; on the other hand, as low a dividend as 2½ per cent. had been forecast by some people. The 3 per cent. dividend absorbs practically all the money which the Board shows to be available for distribution to its "C" stockholders. That the dividend is fairly well up to expectation may be inferred from the fact that the price of the stock is but little changed on the week. Actually it is 10s. better at 79. Hopefulness is inclined to think that there may be a further distribution, of some modest amount, still to come in respect of the year lately ended. Also there are other people who suppose that the directors have acted the more cautiously by reason of the fact that the arbitration with Tillings is not yet decided. The prior-charge stocks of the Central Electricity group have kept very firm.

American Business

Accounts from the other side of the Atlantic in regard to the state of affairs in business circles, both in the U.S.A. and Canada, lean to the view that conditions, while still far from favourable, are beginning to shape towards a brighter outlook. This view may be the harnessing of cause to effect: American prices have been improving a little, and some kind of justification on the lines just mentioned is put forward as the explanation of the upward movement. Canada seems to be going ahead more quickly than the U.S.A. Ambitious schemes are likely to be put into early operation in connection with hydro-electric works and extensions. A less dolorous tone is observable in most of the dollar stocks. Even Brazil Tractions, which were down to 8 last week, have rallied to 9⅛. American Telephone and Telegraph recovered a point, but went back to 107½. Internationals are ¾ better at 9¼. Montreal Light & Power have picked up 1¼ to 34. Shawinigan Water is steady at 19¼.

Manufacturing and Equipment

Few alterations of any consequence have occurred in the prices of shares in this group. There is a renewed tendency to buy preference shares. Crompton 8 per cent. preference at 33s. 9d. are 1/6 better. Of the ordinary shares, General Electric eased off to 45s. A few hundred Siemens came upon a market not too willing to take them, and the price went back to 16s. 3d. Associated Electrical Industries have strengthened to 18s. 6d. on the official announcement of the increase in orders during the current year. The quickened activity in gold-mining throughout the world is again quoted as affording ground for a reasonable hope that the big manufacturing companies will obtain substantial orders for machinery, &c. In this connection a further rise to 6 7/16 in Victoria Falls ordinary shares may be mentioned as due to the great increase in business that the company will obtain through the opening up of fresh gold-mining areas on the Rand.

The Year's Changes

Occasion has been taken in previous years to set out, in early August, a list of comparative prices, for indication of the manner in which Stock Exchange prices have treated the holders of Stock Exchange securities during the year, up to date. With so many other matters of moment claiming attention at the present time, the demands made upon the space allotted to these financial columns are such as to preclude the usual presentment of such tables this month. It may be said, however, that the current quotations for the ordinary shares in the London Electricity Supply companies section are almost identical with those that ruled at the beginning of the year. There is hardly sixpence a share difference, on the seven months, in the prices, for example, of Brompton and Kensington, Charing Cross, Chelsea, Kensington, and Westminster shares. The provincial undertakings exhibit little alteration. The changes are somewhat mixed in character. Lancashires, for instance, are 2s. 6d. higher, Midland Counties 1s. 3d. North Easterns have lost half a crown, Northampton 1s. 3d., Bournemouth & Poole 9d.

Other Variations

British Electric Traction deferred stock started the year at 450; it now stands at 645. There are not many stocks which have as satisfactory an increase as this. Cables & Wireless preferred at 69½ is 5 points down on the year. The "A" ordinary stock has fallen from 24 to 13. Great Northern Telegraphs at 35 are 50s. higher. American Telephone and Telegraph is 2 points down: Internationals have dropped 3¼.

Amongst the shares of the manufacturing and equipment companies, the fluctuations have left prices lower as a result of the seven months' working. For some reason or other an impression arose earlier in the year that the companies were making lower profits, but the dividend announcements and annual accounts lent little support to this idea. The volume of investment has been well maintained. A certain amount of supply has come from New York, thrown out during the minor crises that have followed upon this year's disturbances in the United States. The British iron and steel companies are making headway, and the improved state of trade in this country has attracted notice from the investor. Babcock & Wilcox are 3s. higher on the year at 43s. The rubber industry has been at length placed upon a firm basis through the efforts of an International Rubber Regulation Committee. Business during the past seven months in a number of Stock Exchange markets was tolerably active.

Share List of Electrical Companies

	Nom.	Dividend. 1932.	Dividend. 1933.	Price. Aug. 7.	Rise or Fall.	Yield. p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	77/6	—	3 17 2
Brompton Ordinary	1	7	7	34/-	—	4 2 4
Charing Cross Ordinary	1	7	7	34/6	+6d.	4 1 2
Chelsea	1	7	7	34/-	—	4 2 4
City of London	1	7½	7½	35/-	—	4 5 9
Clyde Valley	1	7	7	39/6	-6d.	3 10 9
County of London	1	10½	10½	57/6	—	3 13 1
Edmundson's 7% Pref.	1	7	7	34/-	—	4 2 4
Elec. Dis. Yorkshire	1	9	9	47/-	—	3 16 6
Elec. Supply Corporation	1	11	11	59/6	—	3 13 10
Kensington Ordinary	1	7	7	34/-	—	4 2 4
Lancs Light and Power	1	7	7½	37/6	—	4 0 0
London Electric	1	7	7	34/6	—	4 1 2
Metropolitan	1	10	10	52/6	—	3 16 2
Midland Counties	1	7	7	37/6	—	3 14 8
Mid. Elec. Power	1	8	8	42/9	—	3 13 2
North Eastern Electric Ordinary	1	6	6	33/-	—	3 12 10
Do. 7% Pref.	1	7	7	35/-	—	4 0 0
Northampton	1	10	10	53/9	—	3 14 4
Notting Hill 6% Pref.	10	6	6	14½	—	4 4 4
North Met. Elec. Ordinary	1	10	10	62/-	-6d.	3 4 6
Do. do. 6% Pref.	1	6	6	31/-	—	3 17 5
St. James' and Pall Mall	1	7	7½	35/-	—	4 5 9
Scottish Power	1	8	8	40/-	—	4 0 0
South London	1	7	7	36/-	—	3 17 9
Westminster Ordinary	1	7	7	34/6	—	4 1 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	21/-	—	7 2 10
Yorkshire Elec.	1	8	8	46/3	-9d.	3 9 1
PUBLIC BOARDS.						
Central Electricity, 1950–70	Stock	5	5	115xd	—,	4 7 0
Do. 1955–75	„	5	5	118	—	4 4 9
Do. 1951–73	„	4½	4½	109	—	4 2 7
Do. 1963–93	„	—	3½	101	—	3 9 4
London & Home Counties, 1955–75	„	4½	4½	108	—	4 3 4
London Passenger Transport, A	„	—	4½	118	+1	3 16 3
Do. do. B	„	—	5	121	—	4 2 8
Do. do. C	„	—	3	79	+½	3 16 0
West Midlands Joint Elec. 1948–68	„	—	5	114	—	4 7 9
TELEGRAPH AND TELEPHONES.						
American Tel. & Tel.	$100	9	9	107½	-2	8 7 6
Anglo-Am. Tel. Pref.	Stock	6	6	112	—	5 7 2
Do. Def.	„	1½	1½	27	—	5 11 1
Cables & Wireless 5½% Pref.	„	2¾	2¾	69½	—	3 19 2
*Do. A. 7½% Ord.	„	Nil	Nil	13	—	—
Do. B. Ord.	„	Nil	Nil	6½	—	—
Globe Tel. and T. Ord.	10	Nil	2½	9	-½	2 14 6
Do. do. Pref.	10	6	6	12½	—	4 18 0
Great Northern Tel.	10	20	20	35	—	5 14 4
Marconi-Marine	1	10	7½	31/3	+1/8	4 16 0
Oriental Telephone Ord.	1	12	12	3 1/8	+1/8	*3 15 3
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	1/6	—	—
Do. do. 2nd Pref.	5	Nil	Nil	1/6	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	3½	—	—
British Electric Traction Df. Ord.	„	5	5	645	—	—
Do. do. Pref. Ord.	„	8	8	157½	—	5 1 7
Brazil Traction	100	—	—	9½	+¼	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	105	—	4 15 3
Mexico Trams, 5% Bonds	—	5	5	22½	-2	—
Mexican Light Common	100	Nil	Nil	3½	—	—
Do. 7% Pref.	100	7	7	7½	—	—
Do. 1st Bonds	—	5	5	47½xd	—	10 10 6
Victoria Falls Ord.	1	15	20	6 7/16	+1/8	3 2 0
Yorkshire (West Riding)	1	2½	5	25/9	—	3 17 8
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	10	10	53/9	—	3 14 6
Assoc. Elec. Ord.	1	4	3	18/6	+6d.	3 4 10
Do. Pref.	1	8	8	32/-	—	5 0 0
Babcock & Wilcox	1	9	6	43/-	+6d.	2 15 10
British Aluminium Ord.	1	5	5	28/3	—	3 11 0
British Insulated Ord.	1	15	15	70/-	—	4 5 9
Brush Ord.	Stock	Nil	Nil	33	—	—
Callender's	1	15	15	3 1/8	—	4 14 1
Do. 6½% Pref.	1	6½	6½	31/3	—	4 3 2
Crompton Parkinson Ord.	5/-	22½	12½	25/6	—	4 18 4
Do. 8% Pref.	1	8	8	33/0	+1/8	4 14 10
Edison-Swan 1st Pref.	1	7½	7½	21/3	—	7 1 2
Do. 5% Deb.	Stock	5	5	107½	—	4 13 0
Electric Construction	1	Nil	Nil	11/3	—	—
Enfield Cable Ord.	1	25	20	87/6	—	4 11 4
English Electric	1	Nil	Nil	5/9	—	—
Do. do. Pref.	1	Nil	Nil	9/6	—	—
Ever Ready	5/-	35	35	20/-	—	8 0 0
Ferranti Pref.	1	7	7	26/6	—	5 5 0
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	8	8	45/-	-9d.	3 11 1
Henley's	1	30	30	6½	—	4 17 8
Do. 4½% Pref.	5	4½	4½	5½	—	4 1 9
India-Rubber Preferred	1	—	—	18/9	—	—
Johnson & Phillips	1	5	5	22/-	—	4 11 0
Siemens Ord.	1	6½	4	16/3	-1/8	4 15 6
Telegraph Construction	£1	Nil	Nil	1	—	—

*Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1932

13137. "Radio and other modulated carrier-wave transmission systems." Marconi's Wireless Telegraph Co., Ltd., and W. T. Ditcham. January 10th, 1933. (413267.)

31669. "Electric cables." Pirelli-General Cable Works, Ltd., and G. Bonetti. November 9th, 1932. (413295.)

31814. "Electric Motor Control Systems." British Thomson-Houston Co., Ltd. (General Electric Co.). November 10th, 1932. (413268.)

34411. "Electric induction furnace arrangements." General Electric Co., Ltd., and J. Goodman. December 5th, 1932. (413297.)

34584. "Electric indicating or control systems." H. Baron (A. S. Fitzgerald). December 6th, 1932. (413269.)

34875. "Electric cooking stoves." Jackson Electric Stove Co., Ltd., and T. J. Lattimer. December 8th, 1932. (Cognate application 4757/33.) (413298.)

34978. "Electric motors." General Electric Co., Ltd., H. C. Turner and A. Sherwin. December 9th, 1932. (413287.)

36294. "Mounting of electric lamps of the tubular type." A. E. Chapman and E. Greetham. December 20th, 1933. (413362.)

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563. "Long-distance telephone cable, especially a long-distance ocean telephone cable." Siemens and Halske Akt.-Ges. Aug. 6th, 1932. (413271.)

756. "Electric discharge devices and circuits used therewith." F. B. Dehn (Radio Research Laboratories, Inc.). January 9th, 1933. (413302.)

757. "Gaseous electric discharge devices." F. B. Dehn (Radio Research Laboratories, Inc.). January 9th, 1933. (413290.)

758. "Methods and systems of controlling regeneration in electron-discharge devices or the like." F. B. Dehn (Radio Research Laboratories, Inc.). January 9th, 1933. (413291.)

761. "Electric discharge amplifying tubes and method of operating the same." Radio Research Laboratories, Inc. April 14th, 1932. (413303.)

844. "Means for speed regulation of mechanically co-operating electric motors." Allmänna Svenska Elektriska Aktiebolaget. January 15th, 1932. (413278.)

880. "Arrangements of grid-controlled gas or metal-vapour discharge devices which can work as rectifiers and as inverters." Siemens-Schuckertwerke Akt.-Ges. January 26th, 1932. (413292.)

968. "Electric radiators and imitation fires." F. H. Smith. January 11th, 1933. (Cognate application 13274/33.) (413293.)

996. "Electrically-driven clocks." S. J. Smith and Telephone Manufacturing Co., Ltd. January 11th, 1933. (413315.)

1186. "Electrical conductors of the concentric return type." Electrical Research Products, Inc. January 14th, 1932. (413324.)

1208. "Mercury-arc rectifiers and like vapour-electric discharge devices." British Thomson-Houston Co., Ltd., and F. P. Whitaker. January 13th, 1933. (413326.)

1250. "Electric transformers." C. A. Parsons and Co., Ltd., J. Rosen, C. Giles and H. B. Topham. January 13th, 1933. (413330.)

1428. "Electrical installations for illumination circuits." M. Guerin and P. Breton. January 15th, 1932. (Cognate applications 1429/33 and 1430/33.) (413356.)

1447. "Means for increasing and limiting the voltage of a direct electrical current." H. E. C. Jansen. February 5th, 1932. (413358.)

1474. "Automatic telephone systems." Telefonaktiebolaget L. M. Ericsson. January 21st, 1932. (413359.)

1815. "Dismountable vacuum seals." F. E. Bancroft, H. Smethurst, G. Burrows, and Associated Electrical Industries, Ltd. January 19th, 1933. (413364.)

2390. "Variable attenuation networks capable of providing automatic volume control of alternating signal currents." L. E. Ryall. January 25th, 1933. (413383.)

2559. "Radio-receiving systems." A. C. Cossor, Ltd., and F. M. Walker. January 26th, 1933. (413388.)

2916. "Thermionic valves and circuit arrangements incorporating the same." Telefunken Ges. für Drahtlose Telegraphie. January 30th, 1932. (413390.)

3743. "Television systems." W. R. Bullimore and L. H. Bedford. February 7th, 1933. (413401.)

3903. "Modulated carrier-wave receivers." Telefunken Ges. für Drahtlose Telegraphie. February 8th, 1932. (Addition to 393415.) (413402.)

4011. "Holders for electric incandescent lamps." Taw Manufacturing Co., Ltd., and L. G. Weldhen. February 9th, 1933. (413404.)

4221. "Heat-exchange apparatus for fluids, applicable to oil tanks for electric transformers and other purposes." Serck Radiators, Ltd., and H. E. Upton. February 11th, 1933. (413406.)

4554. "Means for suppressing echo in telephone circuits and the like." General Electric Co., Ltd., and L. I. Farren. February 14th, 1933. (413411.)

6600. "Electrically-operated vibratory signals." Ericsson Telephones, Ltd., and C. W. Wilman. March 4th, 1933. (413427.)

7490. "Electric lighting systems of trolley-buses and the like." C. O. Silvers. March 13th, 1933. (413429.)

7729. "Current-collector heads for trolley poles." Estler Bros., Ltd., and N. E. North. March 14th, 1933. (413431.)

7847-8. "Electric storage batteries." Pritchett and Gold, and E.P.S. Co., Ltd., E. S. Chapman, and E. M. O'C. Honey. March 15th, 1933. (413432/3.)

9336. "Telephone and like signalling systems." Ericsson Telephones, Ltd., and L. H. Drysdale. March 28th, 1933. (413442.)

9351. "Muting devices for radio receivers." General Electric Co., Ltd., and C. N. Smyth. March 28th, 1933. (413443.)

10838. "Light-distributing fittings." General Electric Co., Ltd., S. S. Beggs, and W. A. R. Stoyle. April 11th, 1933. (413453.)

12075. "Construction of electric contacts." W. T. Henley's Telegraph Works Co., Ltd., and H. A. Blair. April 25th, 1933. (413461.)

13568. "Regulator and cut-out relay for dynamos." J. Bohli May 13th, 1932. (413469.)

13727. "Electric amplifiers." General Electric Co., Ltd., and B. S. Gossling. May 11th, 1933. (413471.)

16641. "Dimming device for electric lamps." E. Baur. June 11th, 1932. (413484.)

18283. "Electric discharge devices." M.-O. Valve Co., Ltd., C. G. Eden and C. J. Smithells. June 27th, 1933. (Addition to 378994.) (413489.)

21232. "Tuning and reaction control in radio receivers." Ideal Werke Akt-Ges. für Drahtlose Telephonie. August 16th, 1932. (413498.)

21274. "Spark plugs." C. G. Erny. March 6th, 1933. (413499.)

21494. "Electric motor control systems." British Thomson-Houston Co., Ltd. July 29th, 1932. (413501.)

21986. "Echo-sounding apparatus." L. A. M. J. Laboureur and R. Dubois. August 4th, 1932. (413503.)

22158. "Wireless receiving sets." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. September 9th, 1932. (413504.)

22895. "Electrodes or welding rods for use in welding." A. M. Burns and W. F. Proctor. August 16th, 1933. (413509.)

24601. "High-frequency generators suitable for use in radio and like signalling systems." Marconi's Wireless Telegraph Co., Ltd. November 3rd, 1932. (413524.)

26835. "Production of magnetic alloy powders and magnetic cores therefrom." Standard Telephones & Cables, Ltd. (Heraeus-Vaccumschmelze Akt-Ges.) September 29th, 1933. (413526.)

30850. "Thermionic valve circuit arrangements." Telefunken Ges. für Drahtlose Telegraphie. November 5th, 1932. (413544.)

32365. "Electrical oscillating systems." Marconi's Wireless Telegraph Co., Ltd. January 14th, 1933. (413335.)

33652. "Holder or mounting for thermostatic switches and the like." British Thermostat Co., Ltd., and M. Payne. November 30th, 1933. (413558.)

34035. "Television and like fac-simile telegraph systems." Telefunken Ges. für Drahtlose Telegraphie. December 2nd, 1932. (413561.)

34330. "Indicators for showing failure of electric lamps." British Thomson-Houston Co., Ltd. December 9th, 1932. (413562.)

34509. "Electric current conducting trolley wheels." Aktiebolaget Svenska Kullagerfabrieken. December 17th, 1932. (413563.)

35623. "Demodulators for frequency-modulated waves." Telefunken Ges. für Drahtlose Telegraphie. December 16th, 1932. (Cognate application 36524/33.) (413571.)

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2434. "Electrical plate condensers." R. Bosch Akt.-Ges. January 27th, 1933. (413589.)

2889. "Manufacture of zinc containers for electric cells." Vereinigte Deutsche Metallwerke Akt.-Ges Zweigniederlassung Suddeutsche Metallindustrie. February 8th, 1933. (Addition to 387575.) (413593.)

4042. "Liquid compositions for electrical insulation or other purposes." British Thomson-Houston Co., Ltd. February 10th, 1933. (413596.)

7720. "Electromagnetic horns." R. Bosch Akt.-Ges. March 11th, 1933. (413608.)

7872. "Electromagnetic horns." R. Bosch Akt.-Ges. March 13th, 1933. (Cognate application 7873/34.) (413610.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from August 1st:—

Ressel. No. 552343. Class 6. Vacuum cleaning machines.—S. Lesser & Sons, Ltd., 9-10, King Street, E.C.2.

Vioroid Sunshine Radiation Process (lettering and design). No. 547707. Class 8. Mercury-vapour lamps for treating foodstuffs with ultra violet rays.—Vioroid, Ltd., 48, Corporation Street, Birmingham.

Acmite. No. 551669. Class 8. Electric cables.—General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.

Super-Ferrodyne. No. 550801. Class 8. Scientific and philosophical instruments and apparatus for useful purposes.—A. C. Cossor, Ltd., 22, Highbury Grove, N.5.

Cupra Miniwatt. No. 549206. Class 8. Scientific and philosophical instruments and apparatus for useful purposes. No. 549207. Class 11. Instruments, apparatus and contrivances (not medicated), for surgical and curative purposes.—Philips' Gloeilampenfabriek Maatschappij, Eindhoven, Holland (British representatives: Dicker, Pollak & Mercer, 20-23, Holborn, E.C.1).

Falcon (bird design only). No. 551374. Class 8. Accumulators (not for medical purposes).—H. Edgelow, trading as the Falcon Accumulator Co., Falcon Works, Oak End Way, Gerrard's Cross, Bucks.

Klennocrome. No. 550337. Class 50. Polishing preparations.—Ericsson Telephones, Ltd., 67-73, Kingsway, W.C.2.

A Linesman's Death

The death occurred this week of Griffith Williams, who received a severe shock in June last while working on a 10,000-V overhead line. It appears that he was at the top of a transmission line tower when his head came into contact with one of the lines. An inquest was to be held on Tuesday.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Barking.—Flats, North Street and Upney Bridge; borough engineer. Library, clinic, &c. (£12,665), by direct labour; borough engineer.

Barnard Castle.—Houses, Grove Estate; Wetherell, Dent & Pickersgill, architects, Lloyds Bank Chambers.

Beddington & Wallington.—Houses (51), Elmwood Estate, for G. & J. Gibson, Ltd.

Birmingham.—Factory, Stonehurst Estate (£15,000), for Charles Churchill & Co., Ltd., Albert Street. Maternity block, Dudley Road Hospital (£71,566), with electrical work; H. H. Humphries, city architect, Council House.

Bolton.—Houses (24), Crescent Road; William Jones. Houses (102) and flats, Top Brow Estate (£28,282); R. C. Tarran, Hull. Technical college (Competition); city architect. Alterations to Theatre, Gas Street; Little Theatre Guild. Extensions, Holy Infant's School, Baxendale Street; Rev. J. O'Shaughnessey. Reconstruction of 98 steel houses, Union Street Estate (£14,700); borough engineer.

Bootle.—Estate development, Harris Drive; J. H. Riding. Public baths, Orrell Lido, Derby Park; borough engineer.

Bursiem.—Houses (18), Leek Road, Milton; Mr. Harris.

Cheltenham.—Houses (62), Arle Road; F. Yates. Houses (22), Brooklyn Road; borough engineer.

Chertsey.—Houses (38), Rivermead Estate, New Haw, for E. P. Griffin. Houses (100), Bois Hall Estate, Addlestone, for A. W. Sheppard.

Cheshire.—Extensions, Parkside Mental Colony (£96,400); county architect.

Chester.—Employment exchange, Love Street, for H.M. Office of Works, King Charles Street, London, S.W.

Chipping Sodbury.—Houses (20), Heath Field, Yate (£5,897); H. & J. Lemon.

Congleton.—Houses (20), New Street; J. Hood, borough surveyor.

Dudley.—School (£11,400), for Borough E.C.; Mark Round & Sons, Ltd., builders.

Edgware.—Houses (273), Canons Park Estate; D.C. Development Co.

Exeter.—City Hall (£100,000), for C.C.

Flintshire.—Central school, Mold, for County E.C.; director of education, Mold.

Glasgow.—Houses (40), Carnwadric, and 950 Blackhill, 175 Dalmarnock Road, and 100 Hillington Park; housing director.

Guildford.—Development of Park Farm Estate; Knight, Frank & Rutley.

Harrow.—Houses (18), Ashbourne House Estate; G. Young (Floristan). Houses (142), Kenton Lane; Davis Estate Co. Houses (16), Sefton Avenue; A. J. King. Houses (20), Weston Drive; Hardings (London), Ltd. Development of Kynaston Court Estate; Paul Harrison & Co., Ltd. Isolation hospital; U.D.C. surveyor.

Hereford.—Houses (118), Hinton Estate, aerodrome, racecourse site, and bath extensions (£3,500); city engineer.

Holywell (Flintshire).—Factory, Greenfield, for Courtaulds, Ltd.

Hull.—Houses, Endyke Lane (£26,785); W. J. Simms, Sons, & Cooke, Ltd. Branch libraries, Greenwood Avenue, Preston Road (£2,535); Robinson & Sawdon, Ltd. Junior departments, Endyke Lane School and Hall Road School; city architect. Extensions, bus depôt, Anlaby Common; East Yorkshire Motor Services, Ltd. Extensions, Eastfield Road School (£16,106); F. P. Tarran.

Jarrow-on-Tyne.—Houses (160), North Ward area; borough engineer.

Kent.—New buildings for County School for Boys, Chislehurst, for County E.C.

Kidderminster.—Houses (24), Wolverhampton Road, for B. Denning.

Lancaster.—School, Marsh district, and reconstruction of baths; borough engineer.

Leeds.—Houses, Silver Royd Hill; E. Marwood. Houses, Vickers Avenue, Bramley; F. Hinchliffe. Houses (1,000), Gipton Municipal Estate, and forty shops, Municipal housing estates; housing director, Civic Hall. Cinema and shops, Harrogate Road; C. H. & F. Lax. Shops, Old Lane; Simon Newman.

Leicester.—Houses (51), Freakes Ground (£15,726); Simms, Sons, & Cooke, Ltd. Houses (500), Northfield House Estate; city engineer. Extensions, Coleman Road School (£3,570); T. R. Price & Co.

Lincolnshire.—Maternity home, Scunthorpe (£21,750) for C.C.; clerk, Lincoln.

London.—(Ealing).—Extensions, North Ealing and Drayton schools (£5,000); Harris, Ltd. (Greenwich).—Flats (£7,610); borough surveyor. (S.E.1).—Eye hospital (£300,000), Surrey Theatre site, St. George's Circus, for Royal Eye Hospital, Waterloo Road; F. E. Dalton, secretary.

Longton (Staffordshire).—Houses (122), Longton Lane; F. Muston.

Luton.—Houses (24), Brooms Road, and 44, at Trent Road Estate; J. W. Tomlinson, borough engineer. Extensions to factory and new offices, for the Skefko Ball Bearing Co., Ltd.

Malden.—Central library; U.D.C. surveyor.

Mansfield.—Houses (204); A. Farnsworth, Huthwaite Road, Sutton-in-Ashfield.

Meir (Staffordshire).—Houses (50), South Walk; H. Beckett.

Middlesbrough.—Nurses' home and lecture theatre, St. Luke's Mental Hospital (£13,615).

Shopping centre, corner of Crescent and Roman Road, Linthorpe; H. W. Pilkington, auctioneer, Albert Road.

Mountain Ash.—Houses (100), Ynysboeth; U.D.C. surveyor.

Mytholmroyd.—Factory, White Lee Estate, for the Caldene Clothing Co.

Northampton.—Houses (48), Balfour Road; T. Wilson & Son, Ltd. Houses (17), Bowden Road; G. F. Sharman & Son. Houses (39), Briar Hill Road; J. E. Incas. Houses (28), Highlands Way; Chowns, Ltd. Factory extensions, Bunting Road; G. Webb & Sons.

Northenden (Manchester).—Factory, Benchill, for John Crompton & Co., Ltd.

Nottinghamshire.—County offices, Nottingham (£300,000), and secondary school, Loughborough Road, West Bridgford; county architect.

Oxford.—Development of Quarry Fields Estate; F. Wootton.

Paddlesworth (Folkestone).—Houses (74), Redsole Farm Estate; Page & Sons, builders, Cheriton.

Pendlebury (Lancs).—Senior schools (£12,650), for St. Augustine's managers; secretary

Reigate.—Houses (326), Woodhatch Estate, for Davis Estates (Surrey), Ltd.

Rochester.—Houses (24); Thompson & West, Ltd., builders.

Rugby.—Houses (48), Addison Road; borough surveyor. Extensions, Lawrence Sheriff Schools (£6,850); W. H. Jones & Son, Ltd., builders, Coventry.

Rutland.—Central schools, Ryhall and Ketton, for County E.C.; director of education, Oakham.

St. Albans.—Permanent museum with tea-rooms, dressing rooms, &c. (heating and lighting work), £14,500; city surveyor.

St. Helens.—Cinema, Bridge Street, for the Savoy Picture House, St. Helens and Ashton, Makerfield, Ltd.; Frank Haslam, Ltd., builders, 4, Regent Terrace, Doncaster.

Salford.—Police station, Pendleton (£6,149); E. Butterworth & Co., Ltd. School centre, Girls' Institute (£3,280), for E.C. Branch bank, 249, Chapel Street, for Williams Deacons Bank, Ltd., 38, Mosley Street; C. N. Taylor, resident architect, 42, Mosley Street, Manchester.

Salisbury.—Reconstruction of infirmary (£50,838); Webster & Cannon, builders, Aylesbury.

Samlesbury (Near Blackburn).—Joint aerodrome for Preston and Blackburn Corporations.

Seaham Harbour.—Swimming pool; U.D.C. surveyor.

Sedgley.—Houses (42); U.D.C. surveyor.

Sheffield.—Houses (282), Arbourthorne Estate (£85,735); W. Malthouse, Ltd.

X-ray department, laboratories, ophthalmic department, and accommodation for nurses, Southside of the Royal Hospital for Board of Management; William Airey & Sons (Leeds), Ltd., builders, 7, Blenheim Terrace, Leeds.

Skegby.—Houses (20), Healdswood; L. Dodsley, R.D.C. architect, Portland Chambers, Sutton-in-Ashfield.

Southampton.—Cinema and shops, for Associated British Cinemas, Ltd.; Brazier & Son, Ltd., builders.

Southend-on-Sea.—Ritz cinema, electrical work; E. D. Winn & Co., Ltd., builders, Halkin Place, London, S.W.

Southport.—Elementary school, Birkdale and Catholic school, Marshside, for E.C.

Springhead.—Houses (30); Mr. Winder, U.D.C. architect, Oldham.

Stanmore (Middlesex).—Houses (16), Belmont Road; Osment & Weetche. Houses, Camrose Avenue; Mr. Methuen. Houses (17), Marsh Lane; W. M. Bassadone. Houses (32), Prescelley Place; M. Harris. Film studio, dance hall, baths, and 200 houses, Grove Estate, for Film Plays, Ltd.; Relleen & Betts.

Stirling.—New Employment Exchange; architect, H.M. Office of Works, 122, George Street, Edinburgh.

Stockport.—Houses (200), Hazel Grove, for Bowerfield Estates Co., Chester Road, Hazel Grove; Moss & Birks, architects, 4, St. Annes Square, Manchester.

Stockton-on-Tees.—Houses (336), Eastbourne Estate (£100,410); G. Fordy & Sons, builders, Durham Road.

Surrey.—School, West Barnes Lane, Merton (360 places), for County E.C.; secretary, Kingston-on-Thames. County hall extensions, Kingston-on-Thames (£130,000); E. Vincent Harris, architect, 29, St. James's Square, London, S.W.

Sutton Coldfield.—Sessions Courts (£13,081); J. E. Williams, Aston.

Tipton.—Three schools (1,050 places), for E.C.; A. Hastilow, director of education.

Totnes.—Terrace of shops and flats, St. James' Priory Estate; Staverton Builders, Ltd. Houses (36), Collar Park; borough surveyor.

Treswithian.—Houses (18); R. J. Waine, Godolphin Road, Helston.

Trowbridge.—Houses (134), slum clearance (£37,857); A. C. Smith, builder, Dewsbury.

Tunbridge Wells.—Cinema, café, and dance hall, Mount Pleasant; T. Bates & Sons, Ltd., builders.

Walsall.—Institution and workshop for the blind (electrical and heating work), (£6,818); H. Pittaway, builder.

Walton & Weybridge.—Council chamber, &c.; U.D.C. surveyor.

Warlingham.—Houses (18), Hillbury Road; R. J. Clarke & Co.

Warwickshire.—County mental hospital, extensions (£5,125); county architect. Police houses (£6,200); county architect. New schools (£71,000); county architect.

Watford.—Houses (16), Westfield Avenue; J. F. Sleight.

West Sussex.—Senior school, Lancing (£13,023), for County E.C.; D. Fry & Son, builders. Godalming.

Wolverhampton.—Houses (61), Marston Road Estate; Marston, Fellows, Ltd. Houses (24), Pinfold Lane; L. Taylor. Factory extensions, Bushbury; Goodyear Tyre & Rubber Co.